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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW

A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

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Vol. 16 NEW YORK, MARCH, 1918. No. 3

MOBILIZING A BRASS ARMY

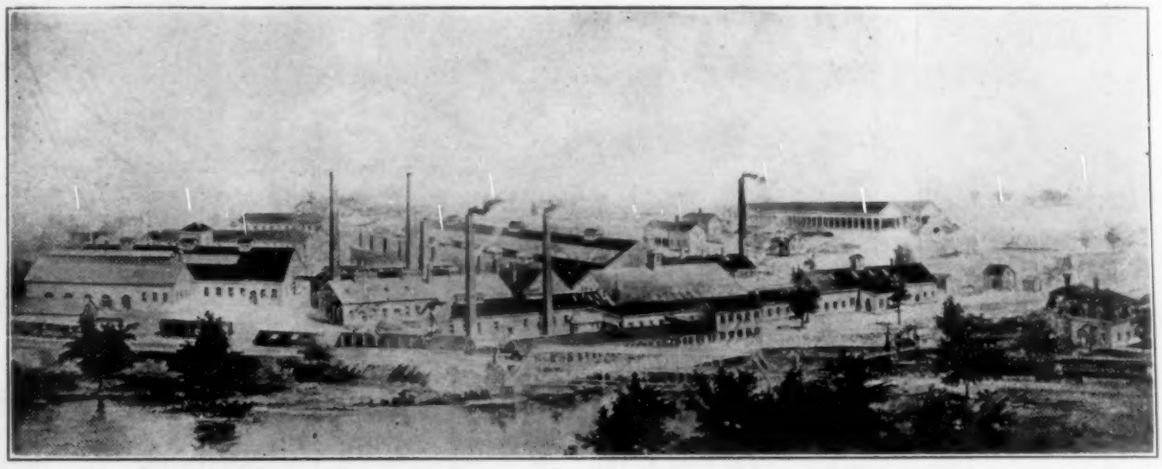
How the Labor Problems Incidental to War's Demands Are Met by the American Brass Company of Waterbury, Conn.

Written for The Metal Industry by E. M. Ruttenber, Torrington, Conn.

Mobilizing a standing industrial army for the American Brass Company in time of war, was a task that involved the best efforts of many men; keeping that army intact at a time when inducements are open to mechanics in many fields, is a feat combining both the practical and psychological to a marked degree.

There are twelve thousand men in the seven plants controlled by the American Brass Company. The system consists of two plants in Waterbury, Conn.; two in Ansonia, Conn.; one in Torrington, Conn.; one in Buffalo, N. Y., and one in Kenosha, Wis. One organization and one spirit prevails throughout these seven plants, not subject to change on account of location or environment. The same conditions that prevail in Connecticut are in force in Wisconsin and the smallest plant offers just as many inducements to ambitions employes as the largest. Men are shifted from one plant to another if they wish to go and the opportunities for betterment are more apparent. The progress of men employed in the brass industry as represented by American Brass Company interests is checked up and kept track of from day to day and transfers involving larger salaries are placed at the consideration of the men without being made compulsory.

The family man is made a subject of special attention at any and all times and his welfare comes in for initial consideration in handling the problems of everyday existence. Unions have but little bearing on the affairs of the American Brass Company. Men go to work at 7 in the morning and work until 6 at night, but the spirit of unrest is overcome by more vital inducements extended. Wages are high, but students of the industrial system will find food for consideration in the fact that last year's earnings were $7,000,000! Throughout manufacturing centers at present the problem of holding men is paramount to the wage question.



A VIEW OF THE COE BRASS BRANCH OF THE AMERICAN BRASS COMPANY AT TORRINGTON, CONN.

The American Brass Company at present has a contract for discs to be used in the making of shells, that will keep the plants busy until next July. In addition to this the other departments are taxed above normal capacity.

Necessarily, help is a matter of unusual importance. The representative of a Bridgeport munitions concern established himself at a hotel in Torrington recently and announced that he was in the market for men. Probably fifty men employed at the Torrington plant interviewed this emissary of an out-of-town concern at his temporary office. Bigger pay for labor was the key-note of his conversation with those who sought his counsel. It might be added at this juncture that he appeared in Torrington because the largest

plant flying the American Brass Company colors is located there and 2,500 men are on the payroll. The proposition was presented in glowing colors, but the lure was unsuccessful. Back of this failure to recruit at the expense of the American's working forces was the co-operation extended its men by the corporation.

On bed-rock issues the company meets all competition from outside sources. It sells coal to its employes at wholesale prices. It maintains an emergency hospital to which employes have access at all times, whether disabled by accidents or natural causes. Foremen and assistant superintendents may purchase gasoline for personal use at the actual cost to the company. No spirit of espionage is maintained in connection with these methods and much is left to the actual honor of participants in the general scheme. To each man is left the task of recording with the proper authorities the amount of coal used or gasoline taken.

Every means is taken to encourage a spirit of co-operation independently among the men. The sick are visited by representatives of the company and their immediate wants provided for, although there is no tangible organization for that purpose controlled by by-laws or a cut-and-dried constitution. Should the men go into the market for supplies on their own initiative, as they did recently in Torrington, the American Brass Company smoothes their path with the credit departments of the concerns filling orders. In this manner recently a car-load of meat was purchased and disposed of among men employed in one department of the Torrington branch. In addition to co-operative measures of this class the semi-annual bonus paid to all employes is an added inducement to "sit tight" when "wild-cat" offers are pouring in from all quarters, voicing the plaints of war-time industries in straits for men.

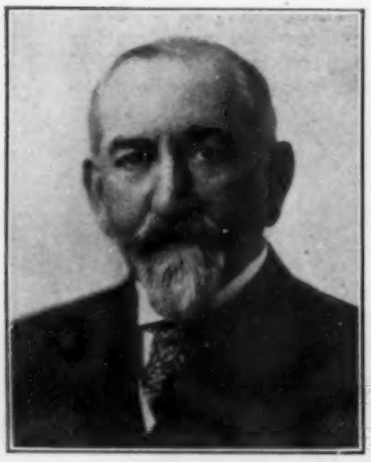
It is quite true that organizations along dictatorial lines are not encouraged, the officials of the company meeting its forces half way in order to avoid any drastic movements through such channels.

A prominent official in the American Brass Company stated recently to me that anything savoring of organization in the several plants controlled by the company was understood as a "gentlemen's agreement," rather than signed and sealed. A canvass of minor employes revealed the same sentiment. A tacit agreement along the lines of mutual betterment has served its purposes far better than a sweeping contract covering a given number of men to a stipulated department. Individual cases are given individual attention. If a man in any department expresses dissatisfaction, his case becomes a matter for consideration at a cabinet meeting. It is sifted to the bottom and the remedy applied. In this manner heads of departments are enabled to keep track of the most minute detail that might have a direct bearing on the efficiency of the branch or the extent of the department's output.

The active head of the Coe branch, located in Torrington is Major William E. Besse, whose official title of "superintendent" covers like a blanket all the many departments that comprise the huge mechanical machine. Between the officials of the American Brass Company and the twenty-five hundred men card indexed in the office comes Besse, the former laborer who outgrew his job and mounted the ladder until he plucked a $15,000 position. He is capable of grasping both ends of an argument and splicing them together. In every branch there is a Besse, handling men of every nationality and disposition. Besse pooh-poohs the idea of organization, while waving an invisible wand that controls an organization as powerful as it is invisible to the untrained vision. In the scope of this semi-obscure fraternity lies its greatest power. It includes every man in the organization, from laborer to skilled mechanic and finds a way to reach each and every one under the girders in the several mills. It is the duties of these heads to find where the seeds of possible dissatisfaction took root and to avoid repetitions of the same. At conferences where individual matters are discussed department heads are taken into consultation in order to acquire a knowledge of the remedies that are best applicable when anything of a similar character confronts them. The quickest results with the least possible fuss are thus arrived at.

If it is deemed advisable, for instance, to transfer a man from the Torrington or the Waterbury plants to Buffalo, the matter is placed before the interested party, the possible advantages of a move of this character described from a financial viewpoint and the ultimate decision permitted to remain with the man himself, without the possible loss of advancement at a future time or the displeasure of the corporation's officials. Unusual ability is instantly recognized.

Until the war hurled broadsides into the ranks of its employes it was the company policy to give men the exclusive preference in the offices. It was not until



C. F. BROOKER,
President American Brass Company.

OFFICE BUILDING AND ENTRANCE OF COE BRASS BRANCH AT TORRINGTON, CONN.

MAJOR WM. E. BESSE,
Superintendent Coe Brass Branch.

hundreds of men had laid aside the pen to shoulder a musket that the female of the commercial species was given consideration.

The American Brass Company plant in Torrington is equipped with one of the most complete emergency hospitals available. In 1917 the records show that 10,915 dressings were made at this infirmary. The hospital is equipped with a thousand-dollar X-ray machine and an electric massage apparatus. A physician pays two visits a day to the plant and calls on the men at their homes if they are unable to work. In case of serious accident they are immediately removed to the municipal hospital through the emergency ambulance maintained at the premises.

WAGES.

The minimum wage paid at the American Brass is 30 cents an hour, and the day's work as told above consists of ten hours. At the present time the men put in eleven hours and are paid at the rate of time and one-half for overtime.

WAR TIME PRECAUTIONS.

There are 34 special policemen at the Torrington plant, fully armed. Thirty-six watchmen are employed night and day around the premises and two specials guard the Coe Brass stream at all hours of the day and night. In addition to this, small standing army there are 120 members of the Connecticut Home Guard among the employes, deputized to guard the premises if rquired. The special police receive $37 a week.

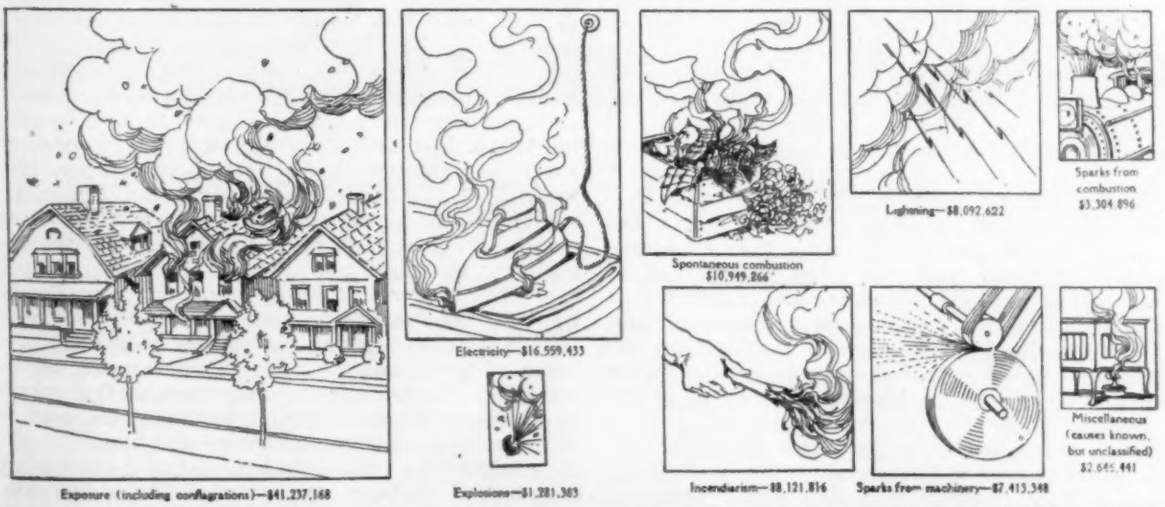
Charles T. Brooker, president of the American Brass Company was recently elected president of the Turner & Seymour Company, located in Torrington, a concern given over to the manufacture of brass parts. Mr. Brooker* received his early education in the Torrington plant, better known throughout Connecticut as the Coe branch. L. G. Kibbe, who retires from the Turner & Seymour plant, has assumed charge of the Stamford Rolling mills, at a salary of $25,000 a year. It is believed that much the same system will prevail at the Turner & Seymour plant with Mr. Brooker at the head as has been so successfully applied throughout the American Brass Company organization in so far as employes are concerned.

*An account of Mr. Brooker was published in THE METAL INDUSTRY for May, 1914.

THE GREAT AMERICAN BONFIRE

THE LOSS BY FIRES FROM ALL CAUSES IN THE UNITED STATES FOR 1916 WAS $208,705,340.

PARTLY PREVENTABLE FIRE CAUSES—$99,606,293.



STRICTLY PREVENTABLE FIRE CAUSES—$60,466,054.

UNKNOWN FIRE CAUSES (PROBABLY LARGELY PREVENTABLE)—$48,632,993.

From the Bulletin of the National Board of Fire Underwriters.

PROGRESS IN ELECTRO-PLATING

Standardizing Stock Replenishing Solutions for Cyanide, Copper Bronze and Brass Solutions.

By Charles H. Proctor, Plating Editor.

In these trying times our country is passing through, in an effort to produce the highest point of efficiency we hear a great deal about "Standardization." Our Government is doing everything within its power to standardize every article necessary to equip our army and naval forces that they may be the most efficiently equipped forces the world has ever seen or perhaps ever will see again. When we are through, when we have played our part in this mighty world drama, when we have proved to the world that when we fight we do not fight in vain, not for selfish interests or for territorial aggrandizement, but for a principle that all men are born equal. That each race and each nation has a right to govern themselves and that these races or people shall be governed as in the words of the immortal Lincoln by a government "of the people, for the people and by the people."

When we have passed through the fire of war and sit at the peace table we are going to see that justice is given to all, for in our hands we hold the scales of justice. We entered this war to obtain justice, we recognize Divinity because our country seeks Divine guidance, but no man whether he be king or emperor shall tell us that he rules by Divine Right and henceforth the governments of the world shall be of the people and peace shall be for the people for all times. We are going to bring peace with malice towards none and charity for all.

> "And then no more shall the war cry sever
> Or inland rivers grow red.
> It shall banish the world's anger forever
> When they laurel the graves of their dead."

This would be the acme of standardization and efficiency if we can only standardize peace so it reaches a hundred per cent then we will have done our part and done it well.

While perhaps not all of my readers are platers, the greater majority are and are always interested in ways and means of doing something for your own advantage. You have learned by the precepts of the American Electro-platers' Society that cooperation is a splendid basis from which to gain knowledge and we are always anxious to gain more knowledge in our chosen profession and it is the aim of the society to make the platers wiser and more efficient.

It is the aim of the plater to reach a degree of standardization, therefore if he can standardize the formulas he uses and then standardize his methods of replenishing the solutions based upon the formula used he will make a great step forward in efficiency.

Our friend, Dr. W. Blum of the Bureau of Standards, who has visited so many of our meetings and conventions, has spoken on the subject of standardization and efficiency and told what the Bureau of Standards can do to help the plater and suggested at the recent St. Louis convention how the society could help the Bureau by financial support to undertake experiments for the benefit of the plater similar to the experiments carried on for the electrotypers who have given financial support to the enterprise.

I am not sure whether a committee was ever appointed by the Supreme Society to assist in securing the funds needed to support a thoroughly practical plater at the Bureau, a man of chemical and practical knowledge who could work in conjunction with the chemists of the Bureau. In this way the Bureau would become familiar with the commercial requirements in electro-plated products in their efforts to produce standard solutions based on commercial efficiency. If this committee has not been appointed I trust that the Supreme president of the society will give this matter due consideration.

I recently had the pleasure of visiting the Bureau of Standards at Washington and spent considerable time with Dr. Blum and also met Dr. Holler who has talked to the electro-platers on several occasions on plating subjects. Later, in company with Dr. Blum, I met Dr. Stratton, the director, and was pleased to learn that an appropriation of $10,000 had been asked for from the Congressional Appropriation Committee to carry on the proposed experiment on electro-plating.

I also visited the new electro-plating department and noted that the equipment had nearly all been installed. I also met Dr. Gruse who will have charge of the department under Dr. Blum's supervision. I mention these facts merely for your information so that you can appreciate the work Dr. Blum is doing for the best interests of the plating industry and the members of the society and which, I am sure, you will all highly appreciate.

In the meantime, while the Bureau is getting ready to work on standardized formulas, let us see what the plater can do for himself on this subject. It is a well known fact that if you prepare a very efficient solution from definite proportions of materials with an absolute knowledge of its metal contents, with a definite voltage and current density covering the amperage per square foot of surface and with a known temperature you can produce a satisfactory deposit upon a given surface area in a definite amount of time. If you can reproduce these same conditions day after day, then you have produced a standardized solution, because you can produce identical results without variation and this means standardization.

With a solution prepared as noted and controlled by a volt and ampere meter and a standardized stock solution of copper and zinc, you can control your solutions with very little difficulty.

In a great many plants throughout the middle west I have given standardized replenishing solutions for copper, brass and bronze solutions for still and mechanical plating. For example, in a plant in Pittsburgh, a copper solution was installed based upon 2 ounces of metal per gallon of water. In many instances solutions containing four to five ounces of metal are installed. The solution was controlled by a volt and ammeter and the temperature was 120 degrees Fahr. At 3 volts pressure and 240 amperes, eighty steel hinges measuring 3¼ x 4 inches were plated in seven minutes. The copper deposit was of sufficient thickness to withstand oxidizing and relieving. The water lost by evaporation from the solution was replaced as required.

This solution was run continually and as fast as one batch of work was taken out another was put in the solution. The voltage and amperage were the factors to which particular attention were given and an analysis was also made to determine the variation of the metal content of the solution. At any time a slight increase of voltage was noted with a decrease of amperage a small addition of cyanide was first added upon the basis of ⅛ ounce per gallon of solution. This amount being frequently increased to ¼ ounce. If the voltage and amperage did not return to normal

with the addition of the cyanide, then it proved that the metal content was slightly deficient and proportions of the standardized stock copper solution were added to the solution until the voltage again read 3 volts and 240 amperes. The approximate surface was 16 square feet at 15 amperes.

The replenishing solution was prepared on a basis of twelve pounds of actual metal, figuring that copper carbonate contains approximately 50 per cent of metal, then the stock solution equalled 24 pounds of copper carbonate. Commercially pure zinc carbonate will contain approximately 50 per cent of metal so both stock solutions were prepared on the same metal basis, that is, 12 pounds of metal.

If we study the brass founders' alloys or the composition of the common yellow brass of commerce we will find that they contain approximately 66 parts of copper and 34 parts of zinc and are commonly termed the "two and one" mixture. Bronze alloys contain 88 to 90 parts of copper and 12 to 10 parts of zinc. With stock solutions prepared on an equal metal basis it is easy to add the stock solutions by measure to control the mixtures needed.

For instance, if a brass solution requires replenishing and the metal has been used up in nearly the correct proportion, then 2 parts by measure of the copper solution and 1 part of the zinc solution will give the correct metal requirements. In bronze plating three to four parts of the copper stock solution can be used to one of zinc. Any variation can readily be made as long as the stock solutions contain the same metal content per gallon of water. The stock solutions that have given such excellent results for replenishing are composed of the following:—

ZINC STOCK SOLUTION.			COPPER STOCK SOLUTION.	
Water	25	gallons	Water	25 gallons
Sodium cyanide...	16½	pounds	Sodium cyanide....	19 pounds
Zinc cyanide.....	22	pounds	Copper cyanide.....	17 pounds
Soda ash.....	8	pounds	Soda ash	8 pounds
Caustic soda.....	2	pounds	Hyposulphite of soda	½ pound

Copper cyanide contains 70½ per cent of metal and zinc cyanide 55 per cent metal, so both solutions therefore contain approximately 12 pounds of metal.

In large plants the stock solutions may be made up in 100 gallon lots.

Experiments made upon an extensive scale have proven that solutions controlled as noted and replenished with stock solutions are great steps forward in standardization in the plating department. The same idea can readily be carried out on all types of solutions of the cyanide or acid types.

SALVAGING WAR'S WASTE.

The empty brass shell cases of the deadly 75's are collected from the battlefields and taken to the rear where they are sent to their munitions plant to be recast. Note the Chinese laborers who are replacing the French soldiers who formerly did this work. There are now more than half a million Mongolians serving as common laborers behind the fighting front. . . . Toulon, France.—French Official. Committee on Public Information.

STRUCTURE OF SPRAYED METALLIC COATINGS

A Study of the Technical Side of the Schoop Process.

By R. Durrer

Although the Schoop process of metal spraying has only been a few years in use, it has already found extensive application. In addition to various other metals, aluminum can be used to form a coating by this process, a result not previously obtained in any other way. The bodies to be coated are not confined to metals, the metallic coating being also applicable on non-metallic materials, such as wood, millboard, paper, etc. With regard to the structure of the coatings produced in this way, some noteworthy experiments have been carried out by Hans Arnold, and published in the *"Zeitschrift fur anorganische und allgemeine Chemie"* (15 March 1917, pp. 67-72). In order to obtain particles of the metal for closer examination, the sprayed metal was collected in a vessel of water, situated about 6 feet away from the spraying nozzle, and a drop of water charged with such particles was subject to examination under the microscope. Fig. 1 shows some of these particles magnified 250 times, and clearly reveals the appendix (of characteristic dendritic structure) formed during the separation of the drop of metal from the wire. For a given distance between the sprayer and the collector the dimensions of individual particles range between 0.01 and 0.15 mm.

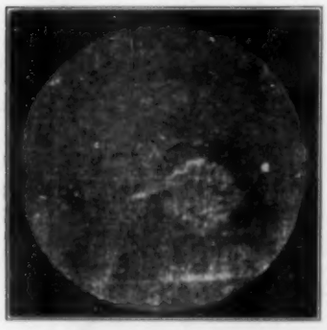


FIG. 1. ALUMINUM PARTICLES, 0.09 MM. DIAMETER; WIRE 1.0 MM. DIAMETER.

Fig. 2 represents a section, magnified 250 times, cut through an iron coating in the direction of the stream of metal, and etched with alcoholic caustic soda. The image is intersected by sinuous lines, which all take the same main direction, the curves being apparently characteristic of metallic coatings produced by spraying. Arnold gives the following explanation of the formation of these curves. In consequence of the kinetic energy stored up in the particles, assisted by the heat which they still retain, they spread out flat at the moment of impact and become superimposed and juxtaposed in form of discs, many of which taper off at the ends, the short axes being parallel to the direction of the spray.

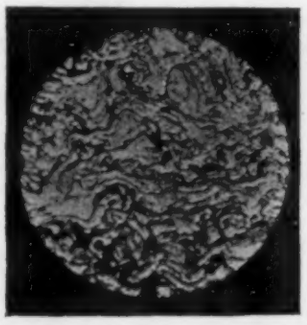


FIG. 2. SPRAYED IRON. CROSS SECTION. ETCHED WITH ALCOHOLIC NaOH.

Fig. 3 is an aluminium coating, produced by spraying three times, and exhibiting a much greater number of curves. Below, on the left hand side, a particle of the coating metal has been forced into a depression in the metallic foundation. Measurement, taking the magnification into consideration, determined the horizontal width as about 0.01 mm., and its mean height as about 0.03 mm.—dimensions corresponding to a volume coinciding with that of the particle of metal issuing from the spraying nozzle (see dimensions cited above). It is true that the volume approximates more closely to the lower limit, most probably because the maximum sectional area of the discs is not exhibited in the section. Examination of the other layers shows that the individual curves never run parallel for any considerable distance, but converge, and thus enclose structures corresponding to sections of plates which taper off towards the edges. These areas bounded by the curves are of unequal size, in accordance with the varying dimensions of the individual particles issuing from the spraying nozzle and their different orientation with relation to the surface of the section; nevertheless, their cubical content is below the limits corresponding to the specified maximum dimensions of the particles. The section taken parellel to the direction of impingement of the particles shows nothing, therefore, but a superimposition of the flattened particles. Confirmation of this hypothesis is afforded by Fig. 4, which represents a section taken at right angles to the direction of spraying, and exhibits configurations which correspond to the cross sections lying at right angles to the direction of spread.

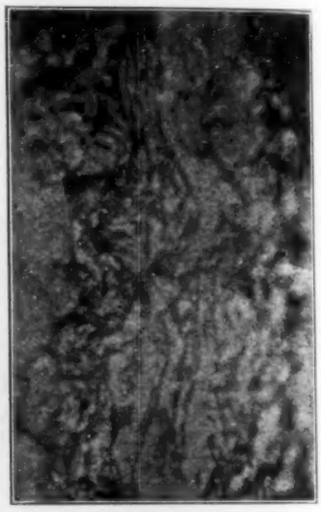


FIG. 3. ALUMINUM ON IRON.

Fig. 4 shows a coating of copper on iron, magnified 500 times and clearly reveals the lines of slip running at right angles to the direction of deformation in the individual cross-sectional figures. It is thus evident that metallography affords useful assistance in the examination of coatings.—"Stahl und Eisen."

FIG. 4. COPPER ON IRON. ETCHED WITH CUPROAMMONIUM CHLORIDE.

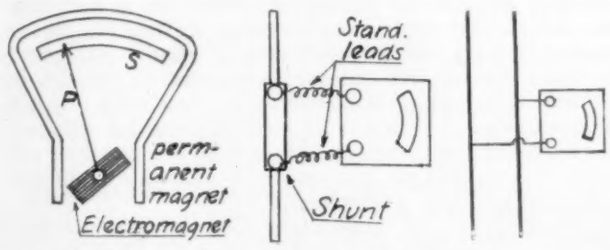
ELECTRO-PLATING ENGINEERING

A Series of Articles Relating to the Operations and Equipment Employed in Electro-Plating and the Reasons Therefor.—Fifth Paper. This Series Began in The Metal Industry, January, 1916.

Written for The Metal Industry by Charles Blake Willmore.

ELECTRICAL EQUIPMENT OF THE PLATING ROOM.

In order to understand the power circuit and the construction and use of electrical instruments, it is first necessary to grasp a few of the fundamentals of electricity itself. The plater uses several terms in speaking of electricity: amperage, voltage, and resistance. To explain these three terms and their inter-relation, electricity is often compared with the flow of water. The amount of water which will flow through a pipe in given time is directly proportional to the force driving it, but inversely



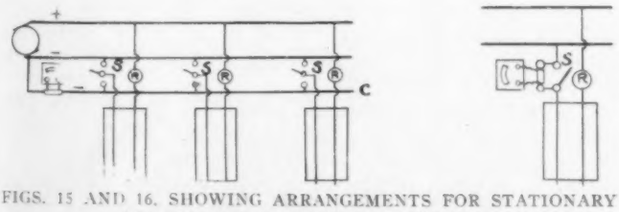
FIGS. 12, 13 AND 14. SECTIONAL VIEWS OF AMMETER, SHUNT AND VOLTMETER.

to the force of resistance with which it meets, chiefly friction on the walls of the pipe.

OHM'S LAW.

In the same way, the rate of flow of electricity, measured in amperes, is directly proportional to the force, or voltage driving it, and inversely proportional to the number of ohms of resistance opposing it. This is known as Ohm's Law and is formulated thus:

(1) $I = \frac{E}{R}$, where I stands for amperes of current, E for volts, and R for ohms of resistance.



FIGS. 15 AND 16. SHOWING ARRANGEMENTS FOR STATIONARY AND PORTABLE WIRING OF AMMETER.

These three units, the volt, the ampere, and the ohm are so chosen that when any two of them are unity, the third one is unity also. Thus if a conductor has a resistance of 1 ohm and a force of 1 volt is applied across its two ends, a current of 1 ampere will flow through it.

By simple algebraic transformations, Ohm's Law may also be usefully expressed in two other ways:

(2) $R \times I = E$, and

(3) $R = \frac{E}{I}$.

Where current is flowing through a conductor there is a loss in voltage all along the line. This loss in voltage is equal to the product of the amperes flowing multiplied by the number of ohms of resistance of the conductor, as expressed by equation number (2) above.

If it is desired to determine the resistance of a conductor it is merely necessary to pass a current through the conductor, determine the number of amperes flowing with an ammeter and the drop in voltage with a voltmeter. Then using equation (3) divide the number of volts by the number of amperes, and the result will be the number of ohms resistance in the conductor.

If the plater understands thoroughly these three different formulations of Ohm's Law and learns how to apply them, he is then well equipped to deal with all the ordinary problems concerning the design of the power circuit and the distribution and measurement of power with which he ordinarily comes in contact in his work.

PRINCIPLE OF THE AMMETER.

The plater is probably familiar with the construction of an electro-magnet, which consists merely of a coil of insulated wire surrounding an iron core. The strength of the magnet is approximately proportional to the number of amperes of current flowing through the coil; hence if we have a means of measuring this magnetism, we can thereby measure the current flowing through the coil.

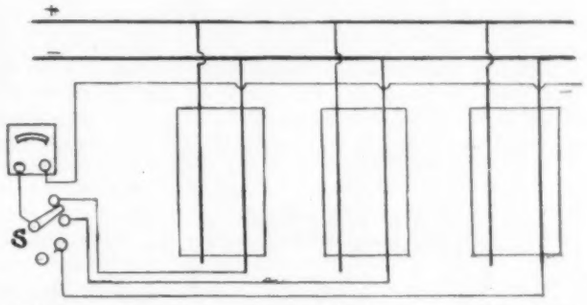


FIG. 17. SHOWING METHOD OF WIRING UP VOLTMETER.

In its simplest form the ammeter consists of a small coil of fine insulated copper wire wound upon an iron core to form an electro-magnet, which is pivoted on jeweled bearings between the poles of a permanent magnet, as shown in Fig. 12. When current passes through the coil, magnetic lines of force are formed about the electro-magnet, which oppose the magnetic lines of force of the permanent magnet, and thus cause the electro-magnet to rotate a certain amount in proportion to the current flowing through the coil. A pointer, P, fixed to the electro-magnet travels over a graduated scale S and thus indicates the amount of current flowing through the coil.

Two spiral hair springs attached to the electro-magnet serve both to carry the current to and from the movable coil and also tend to hold the position of the coil and pointer at the zero point in opposition to the attraction of the magnetic field. In some other types of instruments the electro-magnet is fixed and the permanent magnet is pivoted.

In some of the older types of ammeters the entire current being measured passed through the coil in the ammeter. Where large currents are measured, it is obviously impossible to do this; hence it becomes necessary to divide the current and only send a definite fraction of it through the instrument. This is done by applying the

principle of divided circuits, a corollary to Ohm's Law: Where two or more conductors are carrying a current jointly between them, the amount which each carries is inversely proportional to its resistance. Thus, if two conductors, one having a resistance of 4 ohms and the other a resistance of 1 ohm, are carrying between them 5 amperes of current, then the 4-ohm conductor carries 1 ampere and the 1-ohm conductor carries 4 amperes.

In order to use an ammeter to measure large currents a low resistance conductor, called a "Shunt," is connected in parallel with the coil in the instrument, so that

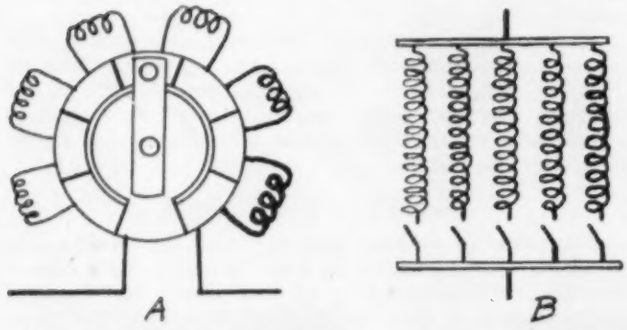


FIG. 18. A, SERIES TYPE OF RHEOSTAT; B, PARALLEL TYPE OF RHEOSTAT.

a definite fraction, only, of the current goes through the coil. This is shown in Fig. 13. If the resistance of the ammeter coil and leads is 99 times the resistance of the shunt, then only one one-hundredth of the current goes through the ammeter. It makes little difference what the exact ratio is, provided the scale of the instrument is calibrated with the shunt and leads, and this same shunt and leads are always used with the instrument. One

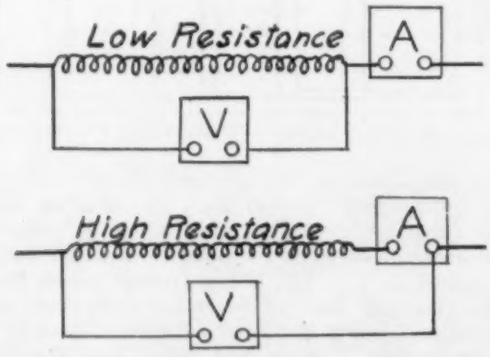


FIG. 19. SHOWING HOW TO CONNECT INSTRUMENTS TO DETERMINE RESISTANCE.

should bear in mind that it is fully as important to use the correct leads with the instrument as it is to use the correct shunt, because any change in the resistance of the ammeter circuit changes the ratio between the resistances of the ammeter and its shunt and causes the instrument to read incorrectly.

In the case of instruments for small ranges of current, as 75 amperes or less, the shunt is often placed within the instrument box, making the instrument more compact and handier to use. However, where an outside shunt is required, one should be careful not to connect up the instrument without it, for to do so invites destruction of the instrument.

The range of the ammeter may be increased by employing larger shunts. For example, suppose that the scale reads to 100 amperes in divisions of 1 ampere when used with the 100-ampere shunt. Then by employing in place of this shunt, another one which has been designed by the makers as a 1,000-ampere shunt for that instrument, the scale then reads to 1,000 amperes in divisions of 10 amperes.

PRINCIPLE OF THE VOLTMETER

Voltmeters are similar in principle to ammeters, the differences being that they are higher in resistance and instead of being used with a shunt connected in series with the circuit, they are connected directly across the line. By equation (1) $I = \frac{E}{R}$, and if R is maintained constant, then the current I is directly proportional to the voltage E. Hence, the number of amperes flowing through a conductor of constant resistance is a measure of the voltage applied. Therefore, if we take an ammeter of high resistance without its shunt and connect it directly across the bus bars, as shown in Fig. 14, the number of amperes indicated on the instrument will be a measure of the number of volts of potential difference between the two conductors. In fact we can then calibrate the scale of the instrument to read directly in volts and thus we have a voltmeter.

There are several reasons why the coil of the voltmeter should be wound with a higher resistance than the ammeter. As the voltmeter is connected directly across the line, high resistance is needed to prevent too much current flowing through the instrument, which might burn it out, or would at least raise the temperature and make the resistance a variable quantity, thus making the readings less accurate. Furthermore, in many cases where the source of power is not very great, if very much current were short circuited through the voltmeter, the line voltage would be reduced and a true reading would not be obtained.

As with the ammeter, the range of a voltmeter may be increased, but by a somewhat different means. The method used is to insert a resistance in the voltmeter circuit; that is, in series with the voltmeter. Suppose that the resistance is 1,200 ohms, and suppose that this is increased 1½ times. Then a scale division represents 1½ times as much voltage as before. Increasing the resistance of the voltmeter circuit in a certain ratio, increases the range of the voltmeter and the value of each division by the same ratio.

Voltmeters may be obtained which are arranged in this manner to give several different ranges. While a range of 10 volts is sufficient for ordinary use in the plating room, it is often desirable to read voltages as low as 1/100th of a volt. By paying about three dollars more for his instrument, the plater can obtain a double range voltmeter which will read to 10 volts by tenths on one scale, and to 1 volt by hundredths on the other.

CONNECTING UP THE INSTRUMENTS.

While it is somewhat more convenient to have an ammeter connected to each tank, such an arrangement is costly and entirely unnecessary, as there are several ways in which one ammeter can readily be used on all of the tanks. Fig. 15 shows such an arrangement in which the ammeter is stationary. The extra fittings needed are: A single pole, double throw knife switch S, of proper capacity, for each tank; and an auxiliary conductor C, large enough to carry the current from one tank at a time. (In figuring size of conductor, allow at least 1 square inch of cross section for each 1,000 amperes.)

Normally the switches are all in the upper position,

but in order to read the current passing through any tank, simply throw its double throw switch into the lower position, and the current is then registered on the ammeter.

In some cases it may be found more convenient to take the ammeter around from one tank to another. The arrangement in Fig. 16 may then be used. This requires merely a single pole, single throw switch S with some handy means of connecting the ammeter shunt across it as shown. This may be done by attaching to each side of the switch a divided spring clip similar to those on the knife switch, and inserting the lugs of the shunt into these clips in the same way that a cartridge fuse is inserted. After doing this the switch S may be opened and the current will then pass through the shunt and be registered on the ammeter.

Fig. 17 shows the usual method of connecting up a voltmeter to read voltages on any tank. The diagram shows this well enough and needs litle explanation. S is a multiple point switch with as many points as there are tanks. By turning the contact arm to any point the voltage of the tank connected to that point is registered on the voltmeter.

RHEOSTATS.

Rheostats are arrangements of high resistance conductors which are inserted in the circuit for the purpose of decreasing the amount of power supplied to the tank. According to their method of construction they are classified as series or parallel. The series type is illustrated in Fig. 18-A. In this type the resistance is varied by turning the handle so as to include more or less of the conductor in the circuit. This type of rheostat is open to several objections. The current must all pass through a single conductor, which means that when the rheostat is carrying the maximum amount of current used by the tank, this conductor is very much overheated, unless the conductor is large in cross section, which in turn requires that it be quite long in order to obtain sufficient resistance. The other objection is that the divisions of resistance are not fine enough to give good regulation. Very often one division may give a current which is too high, while the one next to it gives a current too low, so that it is impossible to obtain the right current.

The parallel type is illustrated in Fig. 18-B. In this type the conductors are of constant length and in order to change the resistance, different combinations of these conductors are connected in parallel. As the conductors are constant in length, each will always carry the same amount of current, and the wire in carrying this current will always be at an even temperature. Furthermore, conductors can be made long enough so the relation between the current flowing and the cross section will be such that this temperature is kept low enough to prevent all danger of burning out the conductors. In order to increase the current, the number of conductors is increased, thus increasing the total cross section in the same proportion as the current, maintaining the same temperature for all loads.

The parallel type also possesses the advantage over the series type of permitting much finer regulation. For example, in the series type five coils in series permit a regulation of only six steps, while a parallel type with the same number of coils, in proper combination, permits a regulation of thirty steps over the same range.

The parallel type is correct in principle and superior in every way to the series type when properly designed and constructed. Rheostats of this design are being made using the highest grade of resistance wire, and there is no question but that they are the best rheostats now obtainable.

PROBLEMS IN ELECTRICAL MEASUREMENTS.

One of the electrical problems most frequently met with is to determine the resistance of a conductor. This is computed very simply after the necessary data is obtained, from Ohm's Law (3) $R = \frac{E}{I}$. All that is necessary is to pass a current through the conductor, measure the amperage and the voltage drop between one end of the conductor and the other very accurately and substitute the amperage and voltage values in the above equation and solve for the ohms of resistance. Fig. 19, A and B shows how to connect the instruments to make this determination of resistance. For the highest accuracy use arrangement A to measure low resistance, and arrangement B to measure high resistances.

(To be continued.)

CHOOSING FURNACES.

A correspondent writes as follows: "We have been using gas and oil for melting, but are considering putting in three coke furnaces and would like to have any information you can give us regarding the installation of three furnaces and also which is the most economical to operate, the natural draft or forced draft?

The furnaces we have purchased are closed at the bottom and have the connection for attaching for air blast, but can open up for natural draft if desired. What diameter flue should we use and what height should it be to take care of three furnaces using a No. 60 crucible for forced draft and what diameter flue and what height should it be for natural draft?"

ANSWER.

Forced draft coke furnaces are generally used where it is desired to melt some very high melting point alloy, such as German silver or where it is essential to obtain an increased amount of metal from a limited number of furnaces. The saving effected by obtaining a greater amount of metal in a given time is usually offset by the shorter life of the crucibles and furnaces themselves. The higher temperature obtained by the forced draft often fuses the ash of the coke to the grate bars impeding the draft. Hence the natural draft is generally to be preferred.

Where forced draft is used, the height of the stack is not important as the stack's function is to remove the waste gases, in other words, it serves as a hood. In fact in some installations of forced or induced draft, where the air is admitted at the bottom of the furnace and drawn through the furnace and flue by a suction fan, no stack whatever is used. In this system a steel pipe lined with firebrick near the furnace leads the waste gases away from the foundry. The fan is placed at the end of the line so that the gases are sufficiently cool when they reach it not to interfere with its operation.

For using natural draft you will find a very cheap and satisfactory plan is to have a separate stack for each of your three furnaces. The flue leading from the furnace to the stack can be about 6 by 4 inches. A brick base should be built about 6 feet high and suitably banded. On the top of this is placed an iron plate which carries a sheet iron stove pipe or stack about 20 feet high and about 9 inches inside diameter. Two furnaces can be attached to each stack if none of the alloys to be melted are of very high melting point. The writer recalls a foundry that built a core oven around one of their stacks and utilized the waste heat in this manner.—J. L. J.

WARTIME PRODUCTION METHODS *

An Article Dealing With the Manufacture and Finishing of Die Cast Metal Parts.
By Charles Pack, Metallurgist, Doehler Die-Casting Company.

When I speak of production methods, I refer to methods of producing metal parts. I doubt if ever before in the history of this country has this subject been of such vital importance. We in this country, and our allied friends abroad are beginning to realize more every day, that the labor situation will ultimately decide this great struggle for freedom and democracy. Battles may be lost by our armies on either front but the war can only be lost through lack of skilled men in our factories to back up our men at the front.

Major Vincent, who is credited with the design of the "Liberty" standardized aircraft motor, in an address before the S. A. E. in New York last month, said that this was a tool makers' war and he was not far from the truth. Take any government activity in this war and you will find that most delays can usually be accounted for by lack of tools and toolmakers. Whether the problem is to build aeroplanes, motor trucks or ships, to produce shells, guns, gas masks, grenades or any of the other numerous appliances of modern warfare, it will generally be found that our production is governed by the number of toolmakers available.

Under these circumstances, it can readily be understood how important it is to develop and improve methods for producing metal parts where machine and tool work is reduced to a minimum. This, gentlemen, is the mission of the die-casting process.

You electro-platers have occasion to handle finished metal parts every day. I doubt if you ever take the trouble to ask yourself how was this or that piece made. I fully realize that you are more concerned with the finish of the part than you are with its past history, but we can ill afford to go through life with our eyes shut to the wonderful things that are being developed around us. The man whose knowledge is limited to the narrow strip of daily work ahead of him soon becomes antiquated and fossilized even in his own line of endeavor.

The metal parts that are plated in your tanks daily have been produced by one of a number of processes which I will review briefly.

1. Stamping: The metal is poured into billets rolled into given thickness of sheet and punched to the desired form in power presses. Tin cans and iron cooking utensils are typical products of this process.

2. Forging: The metal is poured into billets rolled into rods or bars of given dimensions and pieces of these bars pressed to desired shapes in power presses. Automobile crank shafts and connecting rods are typical products of this process.

3. Spinning: In this process the metal is also rolled into sheets of given thickness, pieces of these sheets are set up in lathes and spun by specially designed tools. The method is used to a limited extent for the production of light holloware.

4. Screw Machine Product: Here the metal is rolled into rod or bar, either round, square or hexagonal and machined in specially designed automatic machines. Small screws and nuts are typical products of this process.

5. Casting: Castings may be subdivided into three distinct groups.

A. Sand casting or foundry practice. Here a pattern is first made in wood or metal, an impression of the pattern made in moist sand and metal poured into this impression. Castings so produced are usually rough and inaccurate. Holes, slots, threads, etc., cannot be cast in sand with any degree of accuracy and must be machined subsequently.

B. Slush Castings: This process is used extensively for the manufacture of cheap statuary, clock ornaments, etc. A metal mould is made of the part and the molten metal is poured in. Before the metal has solidified completely the mould is inverted and the liquid metal from the center of the casting runs out, leaving a hollow casting. The metal usually used is zinc or lead.

C. Die-casting: This process consists of forcing molten metal into a metallic mould known as the die. Die castings so produced are accurate to within .001 in. to the running inch and have a smooth surface, requiring little or no grinding before polishing. Holes as small as 1/32 in. diameter are cast accurately and without difficulty by this process. Bevel and spiral gears, internal and external threads are cast finished to size and ready for assembly. It is not a rare occurrence to eliminate 100 machine operations on one part by the application of the die-casting process.

The saving in machining is not, however, the only advantage gained through the use of die-cast parts. Buffing and polishing die-castings require much less labor than similar parts sand cast since the die-castings have a smooth surface.

Tedious soldering and welding operations may often be eliminated by the application of the die-casting process. This was very forcibly demonstrated recently on some government work. It is a well known fact that the gas mask forms one of the most important parts of the modern soldier's equipment, thanks to the humane methods of warfare used by the Huns to impress upon an uncivilized world some of the blessings of Kultur. In preparing the equipment for our first expeditionary force, the War department was called upon to equip the men with gas masks. Some thirty thousand were required in less than a month's time. The breather tube on this gas mask had been designed as a tubing proposition requiring a number of complex soldering operations. When the question of turning out 30,000 of these in a few weeks' time arose, it was found that some 500 expert solderers would be required to do the work and these were not available. The problem was then placed before a die-casting company who redesigned the breather-tube, constructed the die and turned out the castings in ample time and at a very low cost.

In times of peace, die-castings are used extensively for automobile parts, magneto-housings, carburetor parts, spark and throttle gears and levers, starting and lighting systems, roller and ball bearing housings, gum, candy, cigar, cup and stamp vending machines, stamp affixing machines, railroad switch and signal devices, phonograph parts, piano parts, milking machines, cream separators, slicing machines, cash registers, typewriters, time recording devices, moving picture machines, vacuum sweepers and hundreds of other devices too numerous to mention here.

Die-castings are an important factor in speeding the government's ship, aeroplane and ordnance programs.

* Address delivered before the New York branch of the American Electro-platers Society at their ninth annual banquet held at the Broadway Central Hotel, February 23, 1918.

They are used in aeroplanes, army trucks, motor boats, ambulances, shrapnel shells, hand grenades, rifle grenades, field glasses, trench mortar shells, submersible bombs, naval torpedoes, gas masks, wireless telegraphic instruments, aerial bombs and many other implements of modern warfare.

The plating of die-castings has driven many good platers to drink. In discussing the plating of die-castings it is necessary to classify them and consider the different alloys used. Die-castings are being made from zinc, tin, lead and aluminum alloys. The die-castings that are probably best known to you are made from a zinc base alloy containing approximately 90 per cent zinc, the remainder being tin, copper and sometimes aluminum. Phonograph sound boxes and tone arms are made from alloys of this type.

The plating of zinc die-castings has at times proven to be a troublesome and annoying problem. However, when the underlying principles are once mastered, plating on zinc die-castings becomes as simple as plating on iron or brass. I do, however, wish to impress upon you the fact that all zinc alloy die-castings are not alike. Some zinc alloys simply will not stay plated and it is manifestly unjust to blame the plater for blisters and spots when the alloy is really at fault. I met with a case of this kind recently. One of the largest manufacturers of phonographs in the country was meeting with serious difficulties, gold plating zinc alloy sound boxes. I was called in and had a long talk with the foreman plater (who is a member of your society). He told me his troubles and what he had been doing to overcome them. I was impressed with the fact that the plater knew his business and that the trouble was not of his making. The castings would develop blisters in plating, causing rejects of over 90 per cent. I took a sample of the sound boxes with me to the laboratory and analyzed it.

We then submitted some sound boxes made from a somewhat different zinc alloy. The rejections immediately dropped to below 10 per cent and the plater was duly thankful. Unfortunately, however, we also meet with platers who attempt to plate die-castings and are sadly lacking in knowledge of the subject, as well as in training and common sense. I recall one such plater who being unable to obtain a uniformly colored gold deposit on some die-castings, blamed it on the alloy although he had no ammeter or voltmeter and depended on intuition for his amperage and voltage. I appealed to my friend Bill Schneider to put some sense into this plater's head and induce him to invest in some modern instruments. Our friend Bill made the mistake of stirring this man's gold bath and received a torrent of abuse for his trouble. It seems that the heavy slushy precipitate at the bottom of the tank formed parts of this plater's secret process and Bill had touched a tender spot.

During the past seven years, I have had the pleasure of meeting and co-operating with some of the best platers of zinc alloy die-castings. I will attempt briefly to outline what I consider the best method of plating this material.

1. Buff and polish in the usual manner.
2. Clean in gasoline or suitable substitute. Care should be taken that all buffing compound is removed from corners and recesses, using a brush if necessary.
3. Dip in weak caustic bath or suitable substitute. Bath should not be too strong or too hot. One ounce of caustic to the gallon of water should be sufficient. A temperature of 180 degrees will be found satisfactory but the bath should never reach the boiling point. This operation of dipping in caustic is one of the main sources of trouble in plating zinc die-castings and the one least considered when looking for trouble. It must be remembered that zinc alloys are rapidly dissolved and corroded by caustic soda. If the castings are dipped in the soda bath too long or if the bath is too hot or too strong the castings become pelted or tarnished, causing subsequent blistering and spotting. If the bath is right and the proper zinc alloy used, there should be no violent effervescence visible when the castings are immersed in the soda bath.
4. Clean in cold running water.
5. Strike with high voltage nickel.
6. Plate with low voltage nickel until a good uniform deposit is obtained. I have found that the greatest trouble experienced by platers with zinc die-castings is due to the fact that the first deposit is put on too slow. It is for this reason that I advocate a preliminary high voltage bath. A copper or brass strike may also be used but I believe that the nickel bath is the safest. Some platers use the same bath for both the strike and final nickel plate, simply switching the rheostats. This is permissible for a short run but it will soon be found that the nickel bath will take up zinc from the castings and will give a dark deposit.

Where a gold, silver, brass or copper finish is desired, I also advocate the same procedure as outlined, that is, to give casting a substantial protective coating of nickel before plating the other metals. Care should be taken to keep the bath neutral. Most platers use more or less boric acid in their nickel bath but I am not quite sure that this is absolutely necessary.

I fully realize that the method outlined will come in for a good share of criticism from some platers, since every plater that I have met in my experience always claims to have the best methods, the best baths, etc. No argument can convince him that he has not got what he claims and that other methods may be as good or better. In my opinion the American Electro-platers' Society can do no better than institute a vigorous campaign for the standardization of plating methods. There is only one "best" method, and there is no reason why that method should not be used universally. By investigating the merits of various plating processes and publishing the results, electroplating would become a more dependable and reliable process.

When an engineer will be able to specify zinc, nickel or copper plating and know just what he can expect from the finished job, the electro-plating industry will take on new life and become one of the most important of the many metal industries.

THIN COATING OF TIN.

Much can be done toward getting a thin coating of tin or tinned articles by keeping the pot at the right temperature. A pyrometer is a great aid in doing this. The tin should be thinly fluid, and if thick and viscous a heavy coating results. The flux should also be kept in good condition and free from dross.

There is no substitute known for tin, and no satisfactory additions to it can be made.

The imported articles on the market may have been tinned by the Plathner-Dorn process. In this and similar processes, tin powder is mixed into a paste of the consistency of paint with fluxing materials, such as powdered chloride of zinc, chloride of ammonium, rosin, etc., and alcohol or water. The properly cleaned articles are coated with the paste and then heated to the melting point of the tin, which then forms a thin and continuous coating upon them.—J. L. J.

TYPICAL CASES OF THE DETERIORATION OF MUNTZ METAL (60-40) BRASS BY SELECTIVE CORROSION

A Report of Results of Investigation Into the Failure of This Material When in Actual Use, Contained in Bulletin No. 103 Issued by the Bureau of Standards, Washington, D. C., Available Now for the First Time.

By Henry S. Rawdon.

INTRODUCTION.

Brass of the type 60 per cent copper and 40 per cent zinc, known under various trade names, primarily, however, as Muntz metal, has a variety of industrial uses, such as sheathing for boat bottoms; tubes for condensers; wrought forms, as bolts and rods; irregular extruded shapes, such as handrails for stairway balustrades, etc. One very common type of deterioration of metal of this composition, particularly when exposed to some electrolyte (e. g., sea water), is

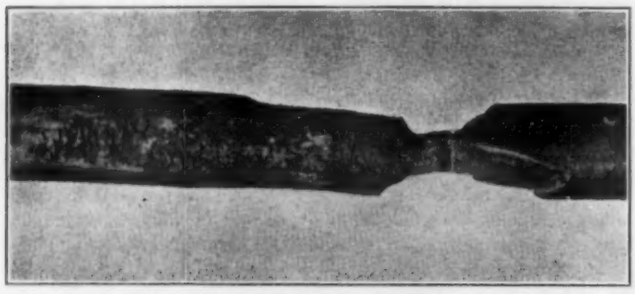


Fig. 1—(a) Surface of a badly corroded Muntz metal bolt.

selective corrosion or "dezincification," the term "selective corrosion" being used to signify a corrosive attack of certain of the microstructural constituents of the alloy rather than a general uniform action upon the metal as a whole. Though this type of deterioration of brass has been known for years and numerous references on this subject have appeared in the technical literature [1] the description of the various forms in which it may occur and of the changes produced in

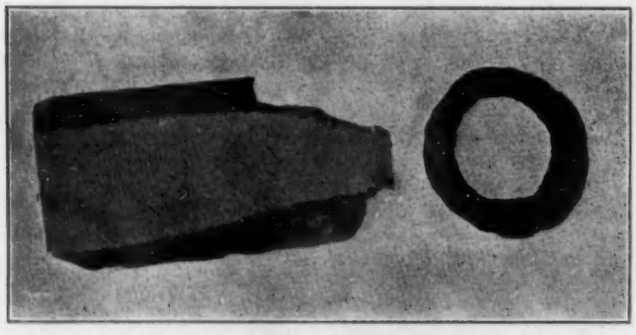


Fig. 1—(b) Cross and longitudinal sections of the corroded portion of bolt a, unetched (×2). The outer or attached portion is copper-red; the center has the yellow color of uncorroded brass.

the metal by which it may be detected are very meager. The numerous samples illustrative of this type of metal failure submitted to this Bureau for examination, together with the inquiries received on this subject, suggested the utility of a description of typical cases of metal affected by this type of nonferrous corrosion as an aid in the detection and identification of similar cases of this type of deterioration of metals. A study of the various forms in which this type of corrosion may occur, together with the resulting structural changes within the metal, also aid in defining the conditions which are most favorable for such deterioration to occur.

[1] See, for instance, Second and Third Reports of the Corrosion Committee of the Institute of Metals, Jour. Inst. of Metals, 1913, X, and 1916, XV, respectively; J. O. Arnold, Engineer, 85, p. 363, 1898; and Milton and Larke, Proc. Inst. Civ. Engr., 154, p. 138, 1903.

CHARACTERISTIC APPEARANCE OF TYPICAL CASES.

In general, by the attack, or process of dezincification, the clear yellow Muntz metal having an ultimate strength in tension of approximately 40,000 to 60,000 pounds per square inch, depending on the physical condition of the metal, is converted into a reddish-colored mass resembling poor copper, often so weak that it may be easily broken by the fingers alone or chipped and cut with a knife, though it still retains the initial shape and size. The red color of the attacked metal is intensified by rubbing the part with a cotton swab soaked in dilute ammonium hydroxide and

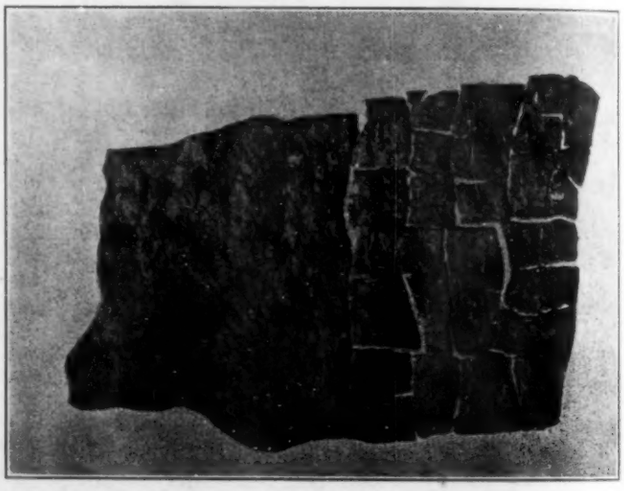


Fig 1—(c) Boat sheathing after dezincification (×1). The portion at the right was broken into the fragments shown by the fingers alone.

then rinsing with water. The surface is freed from its film of oxide and the unattacked portions assume the original yellow color, the corroded spots become a brownish-red. The Muntz metal bolt shown in Figs. 1 and 2 was taken from the keel of a seagoing lifeboat after six years' service. The sample shown is illustrative of the condition of all the bolts used in this particular case to attach the keel to the keelson. To the casual observer the broken bolt appears to consist of a brass center with a heavy deposit of porous copper covering it. The location of that part of the bolt which was most severely attacked and its relation to the position within the keelson is of interest and is suggestive of one of the possible contributing causes to this type of corrossion. This is shown in Fig. 3. It will be noted that the portion of the bolt which was most deeply corroded is that part which was subjected to the greatest service stresses (transverse bending) although apparently this material gave six years' service, it should be borne in mind that the

bolts were not constantly bathed in sea water for this period and that the periods of attack were intermittent as illustrated by the concentric lines in Fig. 1B.

EFFECT OF HEAT TREATMENT.

It has been suggested that the differences shown by different lots of Muntz metal in their resistance to this type of corrosion is to be attributed to unavoidable variations in the heat treatment such samples have received;[2] and that thorough annealing of the

Fig. 2—(a) Unattacked Muntz metal (Fig. 1, b). The light-colored matrix is the zinc-rich or β constituent, in which are embedded the finger-like crystals of the α or constituent richer in copper. (×500.)

alloy at 650° to 800° C will prevent the preferential attack of the β, or zinc-rich, constituent. A series of samples of new sheet Muntz metal of the following composition were annealed for periods varying from 30 minutes to 4 hours; one series at approximately 370° C (360-373°C), the second at approximately 640° C (625-655° C):

	Per cent
Copper	61.35
Lead	.46
Tin	.16
Iron	.20
Zinc (difference)	37.83

Fig. 2—(b) Corroded Muntz metal. At the edge of the corroded portion (Fig. 1, b) the β constituent has been converted into a porous mass of copper (black in the figure) which still retains its former shape. (×500.) Etching in both cases, ammonium hydroxide and hydrogen peroxide.

[2] Second Report of Corrosion Committee, discussion by Sir Gerard Muntz, Jour. Inst. Metals, X, 1913, p. 101.

These two annealing temperatures were chosen so as to illustrate the possible effect of heating below or above the transformation which occurs in the β constituent at 470° C. The samples were then immersed in 5 per cent solutions of sodium chloride for a period of 70 days, each sample being suspended by silk thread, proper care being taken to avoid contact with each other or with the glass sides of the container. No effort was made to regulate the temperature of the solution; it varied between 12° C and 20° C. At the close of this period a microscopic examination of cross sections of the samples showed that each one had been attacked to a slight degree. This attack, which is confined to the β constituent, was not general over the entire surface but was confined to small local centers. Each sample showed closely adhering white specks of basic zinc chloride; the metal under such speck showed a dezincification of the β constituent to an average maximum depth of 0.39 mm (0.0156 inch).

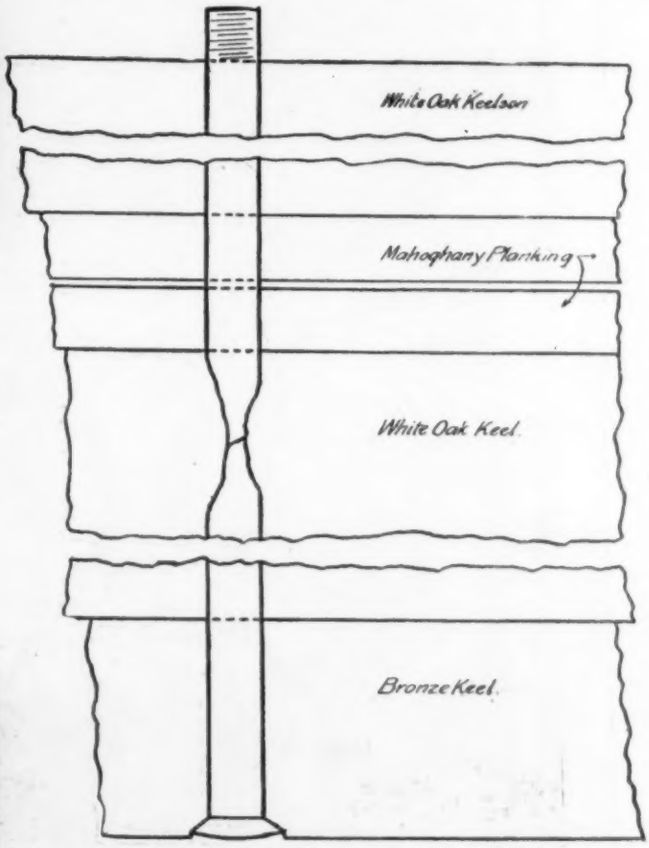


Fig. 3—The part which was most severely corroded corresponds to the portion most highly stressed (i. e., transversely) in service. Arrangement of the Muntz metal bolts (type 1) in the keel of the boat.

The depth to which this attack of the β constituent had penetrated varied from 0.31 mm (0.0124 inch) to 0.05 mm (0.0020 inch), but apparently bears no relation to the previous heat treatment of the sample but rather to the character of the surface, a slightly roughened or pitted surface forming a much better support for holding the zinc-chloride deposits, which form from the slight general attack of the metal when first immersed, than a smoother one does. The samples heated for two and four hours at the higher temperature, 640° C, had lost some of the zinc by volatilization, so that much of the surface layer is consisted of but the α constituent. No attack of such portions was observed.

Samples of the same material used above were quenched in water after heating to a temperature of 690° C. At this temperature both constituents, α and β, still persist. The attack in this case was more rapid, the β having been attacked to a depth of 0.125 mm (0.005 inch) after 13 days' immersion in 5 per cent sodium-chloride solution.

The obvious conclusion to be drawn is that thorough annealing of the metal is not sufficient to entirely inhibit the selective corrosion of the material. The accelerating influence of the adhering deposits of the basic zinc chloride, however, appears to be a necessary condition for such an attack of the annealed metal.

TEMPERATURE.

Practical cases of the effect of temperature upon this type of corrosion have been brought to the attention of this Bureau. One striking example is that of the corrosion of the tubes of a condenser using sea water. The outlet pipe, in which the water was always considerably warmer than the incoming stream, corroded badly enough to require replacement several times while the inlet pipe was still intact and in service. The effect of temperature upon corrosion of similar material has also been studied by Bengough.[3]

[3] Second Report of Corrosion Committee, Jour. Inst. Metals; 1913.

ACTION OF "FLUX" ON MUNTZ METAL.

Muntz metal which has been cleaned by the use of zinc chloride, ammonium chloride, etc., often used as a "flux" for cleaning metal surfaces, by heating the metal and rubbing with a swab saturated with a solution of the substance used often assumes a red color. That this reddening of the surface is a particular case of dezincification is shown by microscopic examination of cross sections of the metal taken through such reddened areas. The suggestion is offered that metal which has been so cleaned and, consequently, which shows dezincification to a slight extent may be, perhaps, more readily attacked in service, particularly if the metal contains any slight surface cracks and depressions which might serve to hold the chloride and thus act as centers.

A 300-ton hydraulic seamless copper tube drawing machine and its product. The machine was built and installed by the Hydraulic Machinery Company, Ltd., Montreal, at the plant of the Dominion Copper Products Company. The designer of the machine, Ferdinand Deming, is shown in his shirt sleeves, while the operator, T. W. Pearce, appears in the insert. Mr. Pearce's best run on the machine was 630 draws for 8 and 9.2 inch copper shell bands in 10 hours.

SUMMARY

1. The deterioration of Muntz metal by selective corrosion is illustrated by four types, including tubing, sheets, and forgings. The metal becomes red in color, very weak, and brittle by this type of corrosion, which takes place when the piece is exposed to some electrolyte.

2. The metal has a duplex structure, one of the constituents, β, being very much higher in zinc than the other, α. In all cases, the selective corrosion consists

of a preferential attack of the zinc-rich constituent and the formation of a porous "copper" mass which fills the network of holes previously occupied by the β. This attack may or may not be followed by that of the second constituent.

3. The rate at which the α phase is attacked is variable. The attack of this constituent may follow almost immediately that of the β or may be indefinitely delayed.

4. A state of dezincification may result in α brass under certain conditions, although the method of attack as revealed by the microstructure is different.

5. The line of demarcation between attacked and unattacked portions is very sharply defined. The action is not a gradual one, but the change is an abrupt and complete one even within the individual β crystals.

6. One of the most important conditions favorable to this type of corrosion, which occurs commonly while the metal is immersed in sea water, is the accelerating effect of the closely adhering deposits of basic zinc chloride resulting from the attack of the metal. Other influences which may accelerate the rate of attack are contact with substances more electro-negative than either the α or β constituents, and increase of temperature, and the effect of stresses to which the material may be subjected while in service.

7. Thorough annealing of Muntz metal does not entirely prevent the selective corrosion of the β constituent.

[The bulletin 103 of the Bureau of Standards from which this matter is taken contains 28 pages and is profusely illustrated with photomicrographs. Copies may be had for ten cents each by application to the Bureau.—Ed.]

TINNING GRAY IRON CASTINGS

SOME PERSONAL EXPERIENCES THAT ARE OF VALUE TO THE METAL FURNISHERS.

WRITTEN FOR THE METAL INDUSTRY BY W. H. PARRY, SUPERINTENDENT NATIONAL METER COMPANY, BROOKLYN, N. Y.

In the February, 1918 issue of THE METAL INDUSTRY there appeared an article on "Tinning Cast Iron" by C. V. H. and from its general tone it would seem to be an answer to one or many questions from subscribers who are seeking up-to-date information on how to coat gray iron with tin.

I can honestly state that for such a short treatise bearing on such a subject, it contains more "honest-to-goodness" information than is contained in any and all the text books ever published.

There is but little to add to this most excellent data and I hesitate to attempt to better the instructions contained therein, but perhaps a recital of the writer's own experience with the art will be the best method of imparting the extra information which, with that by C. V. H., should put beginners at their ease when starting in.

C. V. H. states that "each cast iron tinning proposition is a problem by itself" and that is the crux of the art. All gray irons will not tin, and unless the source from which the iron comes is known and its chemical constituents, it would be advisable not to start laying out good money on a tinning plant as it will be foredoomed to failure.

Not so many years ago, when we were in the throes of operating our own galvanizing kettles, we had as a foreman a man of exceptional intelligence so far as galvanizers go, but who was very chary of handing out any information to others regarding his chosen calling, he having the old-fashioned prejudice on that score which is still in evidence in the various trades.

One day there was brought into the galvanizing plant a quantity of gray iron castings that were, without a doubt, the best specimens of the founders' art that we had ever received. In passing through the department I was hailed by the galvanizer, who in a sudden burst of confidence told me that "he could *tin* those castings, they were so good." Having a small kettle of tin always in a molten state in another department, I told him to go ahead, which he proceeded to do, with the result that the workmanship was of the best, and the castings looked good enough to eat.

When asked for an explaantion as to why he could tin *that* batch of castings and could not coat those from a previous lot from an entirely different foundry, he could offer no valid reason, and that is where the writer caught on to the fact that all gray iron cannot be tin coated successfully.

It was astonishing with what ease the tin coat was applied. A very short stay in the pickle containing 1 part of hydrofluoric acid and 30 parts of water, followed by an immersion in the muriate of zinc. The castings were then allowed to drain by placing them on a grating covered box, after which they were immersed in the tin until the temperature was at least equal to that of molten tin. The castings were then drawn up and through the bath and were shaken well while gripped in the tongs, and finally put aside to cool.

Better results than we attained can be obtained by a second immersion in another kettle of tin with a slightly higher temperature and covered with tallow.

Concerns considering the installation of a tinning plant and if not in a position to produce their own gray iron castings had better watch out, as castings from job foundries manufacturing gray iron castings are very apt to be variable in their chemical constituents because of the "foreign scrap" which they are so fond of using. By "foreign scrap" I mean the scrap iron that they buy from scrap metal dealers and the constituents of which are unknown and as variable as the pieces are numerous.

The best gray iron for tinning purposes is that made in foundries where no foreign scrap whatever is used, their day's melt being made up of pig, sprues, gates and wasters. Care being taken that the silicon content is never less than 2.50 and never more than 2.75, sulphur under 0.08, phosphorus 0.20 to 0.40, manganese 0.60 to 0.80, and the total carbon very low. It is also essential that castings be thoroughly sand-blasted; in fact, they can be so well sand-blasted that the pickling process becomes all but negligible.

If manufacturers will take the trouble to investigate what other concerns have done in this line, it will be found that the big hardware manufacturers, who specialize in harness fittings, meat choppers and the like, are running their own gray and malleable iron foundry. Not because they like the foundry game, but because they can control the kind of metal used and get results in the tinning line, though malleable iron takes the tin much easier than gray iron.

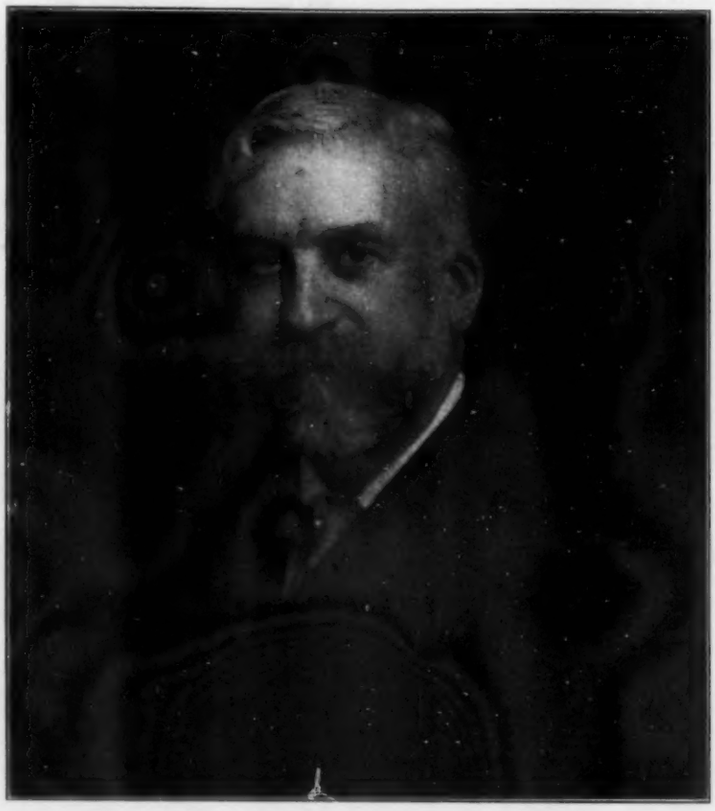
The best of tin should be used, as it will be found to be the cheaper in the end, and care must be exercised in keeping the molten tin at an even temperature, say 500 degrees Fahr. A bright tin finish on gray iron castings is much more easy to obtain by paying strict attention to the class of castings made, than it is to tumble rough castings.

HENRY S. CHASE

THE METAL INDUSTRY LOSES ONE OF ITS FOREMOST MANUFACTURERS.

Henry S. Chase, president of the Chase Companies, Inc., of Waterbury, Conn., one of Connecticut's brainiest and most successful business men, and one who had made a rapid and substantial advance in industrial and financial fields, died in that city Monday, March 4, after an illness of four days. He had been operated on for appendicitis Saturday, March 2, and his condition continued critical until his death. His family was present at his passing.

Mr. Chase was 62 years old on October 1, last, and his death was a great shock to business circles throughout Connecticut, because few knew of his illness, and his splendid physique and constant attention to business indicated the possession of an enviable mental and physical equipment.



HENRY S. CHASE

Henry S. Chase was a native son of Waterbury, his parents, Augustus Sabin Chase and Martha Starkweather Chase, having descended from families of colonial days. His father was one of the leading men of Connecticut at his death. Mr. Chase's education led him through the Waterbury schools, Gunnery, and Hopkins Grammar at New Haven, to Yale College, where he won his B. A. in the class of 1877.

On leaving college he became connected with the Waterbury American, his father being one of the original stockholders of that paper, but he began his life work in the office of the old Holmes, Booth and Haydens Company as an assistant to his father. In 1876 the Waterbury Manufacturing Company was organized with the assistance of the elder Chase, and Henry S. Chase was connected with that company, later taking a more important place following the departure of Charles F. Pope, who was also interested in the company, with A. S. Chase. Henry S. Chase then became secretary of this company.

When his father, A. S. Chase, died suddenly in Paris in 1896, Henry S. Chase found himself at the head of the family interests, which had grown extraordinarily. He saw them expand increasingly through his own life, until to-day they are away beyond the proportions that any one imagined twenty years ago. It is universally conceded that this healthy and remarkable development is to be credited principally to the talents of Henry S. Chase as an executive and organizer.

At the time when Mr. Chase assumed control of the Chase family industrial and financial affairs, there was a movement on foot throughout the Naugatuck valley to consolidate the brass interests. The Scovill Manufacturing Co. had decided to remain independent, and the Waterbury Manufacturing Company decided to be independent and to cast its own raw brass. This brought the Chase Rolling Mills Company into being. The American Brass Company was organized in 1899, and in 1900 the Chase Rolling Mills began operation. Later its business grew so that it became one of the leading competitors of brass rolling plants in the section.

Some twelve years ago it became apparent that this company must seek other field for development, and then its first site, in the Waterville section, on the Naugatuck railroad line, was acquired, and the beginnings of the Chase Metal Works took form. Now the Chase Rolling Mills Company has an extensive and wonderfully developed plant on North Main Street, and one of the most wonderful tube mills of the country, the Chase Metal Works, on the other side of the city, connected by a railroad line built and operated by the company.

Mr. Chase was interested also in numerous other metal enterprises thereabouts, including those of the Oakville Company, Waterbury Clock Company, Waterbury Buckle Company, Smith & Griggs Manufacturing Company, Noeva Manufacturing Company. He was vice-president of the Oakville Company and a director in the other companies. He was president of the Chase Companies, Inc., which was organized to combine the Chase interests proper.

While closely identified with one of the most engrossing of modern industries, Mr. Chase also found time to be a leading banker. He was a director in the New Haven National Bank and in the First National Bank of Litchfield, besides being president of the Waterbury National Bank, the leading National bank in northwestern Connecticut.

He also was a director of the Waterbury hospital, treasurer of the sinking fund of the City of Waterbury, a director of the Waterbury Industrial School, and closely identified with a number of other institutions of a benevolent nature. His clubs included the City, University, Yale and Manhattan clubs of New York, Waterbury Club, Waterbury Country Club, Hartford Club, Country Club of Farmington, Graduates' Club of New Haven, Elizabethan Club of New Haven and the Metabetchouan Fish and Game Club of Canada.

Mr. Chase is survived by his wife, Alice Morton Chase; five children—Mildred (Mrs. Richard Ely), Edith, Anne

(Mrs. Alfred Hart), Rodney, all of Waterbury; and Katharine, wife of Dr. Edgar Stillman, of New York, besides three sisters and two brothers, nad three grandchildren. His brothers and sisters are Irving H., Fred S. and Miss Helen E. Chase, Mrs. Arthur R. Kimball of Waterbury, and Mrs. Edward C. Streeter of Boston.

Besides being an industrial and financial magnate, Mr. Chase was an interested student of art and literature. He was particularly interested in late years in the development of a municipal center in Waterbury, and took a prominent part in the planning of the handsome municipal building. Now the Chase office building is being erected on the site opposite, on Grand Street, and it is believed he had plans for further development of that section along advanced artistic lines, as he had recently acquired practically all the available land between the Federal building and the Municipal building.

His funeral, Wednesday, was attended with the simple service of his faith, but St. John's Episcopal Church, in which the ceremony was held, was crowded with mourners from every walk of life.

The honorary pallbearers were Charles F. Chapin, J. Hobart Bronson, J. Richard Smith, Mark L. Sperry, Albert J. Blakesley, Charles W. Henger, Edward O. Goss and Frank B. Noble. The active pallbearers, all men closely associated with Mr. Chase in his various enterprises, were R. C. Blakeslee, William H. Doyle, George E. Comstock, James Conlong, John W. Hard, Arnold B. Hubbard, John S. Neagle and Adolph Recker.

The City Hall and many business places in Waterbury were closed during the services, and the Waterbury Manufacturing Company, the Chase Rolling Mill, the Chase Metal Works, the Waterbury Clock Company and the Noera Manufacturing Company closed for the afternoon.

As an evidence of Mr. Chase's foresight and his success in building up a strong and efficient organization, it is only necessary to state that there will be no change in the personnel of the Chase interests. Frederick S. Chase, a brother of H. S. Chase, and treasurer of the Chase Companies, Inc., and upon whom the details of active management has been increasingly thrown for some years past, is the new president.

Associated with Frederick S. Chase, as president, is his brother, Irving H. Chase, vice-president, who represents a large ownership in the corporation, and who is president of the Waterbury Clock Company, which makes a great variety of clocks and watches.

The new president is peculiarly fortunate in having for his first assistant Richard D. Ely, assistant treasurer, a son-in-law of Henry S. Chase, a young man of unusual executive ability and tireless energy. Of the place of great importance that is coming to him in the management of the companies, no one who knows them or knows him can be in any doubt. Frank B. Noble, who continues as secretary of the Chase companies, has been associated with them for more than thirty years, and has been in close confidential relations with the management.

THE PLATER AND PRACTICAL ECONOMY

How the American Electro-platers Society Can Help the Isolated Plater

Written for The Metal Industry by P. W. Blair, Mechanical Editor

Just as there are people who have various ways of expressing themselves so are there several ways in which a person or persons may be regarded as economical and efficient. Some persons will declare that an economical person would be one who puts a certain sum of his earnings aside for a rainy day, but how many platers are there who have stopped to really consider what true economy is from a manufacturing point of view. I venture to say very few.

As an illustration our own country is to some extent inhabited with economical and thrifty people, yet it can easily be proven that at least twenty-five per cent. of this country's resources are being unknowingly wasted not only in our cities, but country districts too. Anyone traveling through the country this past fall would have seen apples by the ton lying about wasted, because they were so plentiful this year. Then along the railway there can be seen thousands of old ties either rotting or being burned up in piles. If the country folk were given these ties for domestic fuel they would not be wasted then.

But there is still a much greater waste taking place in ourselves and among the platers. How do we spend our time? Do we endeavor to make every moment count for something or are we blindly plodding along in the same rut? Are the platers of the country improving themselves by acquiring better ways of doing things and becoming more efficient? There are only two sources of wealth in this world and they are raw materials and labor. I have illustrated above how we are wasting raw material, which is not right, and it would be easy to prove that we are each one of us wasting our labor power.

Lumber or other raw materials can be replenished by Mother Earth and Father Time, but the plater's time or labor, if not made the most of, is forever lost and cannot be replenished. I have heard a plater say that he is running so many pieces through his tanks per day, which is a good day's average, but supposing that same plater, by experimenting, has developed a method of increasing his production 25 per cent.—what then? He may not be paid for this increased service in dollars and cents, but the time cannot be far off when such increased earning power will receive its due reward. Then if a plater does not exert every effort to produce and develop all that is possible for him to do, he is doing himself an injury as well as robbing the country of so much of its earning power. No plater lives for himself alone and so no one can get away from the fact that if he is not as efficient in his earning power as he might be he is so far a direct loss to himself as well as to his country.

Now in order to reduce the cost of operating a plating room and increase the efficiency there is only one course to pursue and that is to devote a little more time to technical education, then the plater will know more of what he is really doing and why. The winter nights are now upon us, which give us all time to study, and the American Electro-Platers' Society, with branches in the large cities, has opened up a wide field for research and development work along the lines of practical economy in all branches of the plating trade, and the cost is trivial in comparison with the returns derived from being affiliated with one of the branches.

ALUMINUM IN 1917.

According to the United States Geological Survey the value of the primary aluminum made in the United States in 1917 was $45,882,000, an increase of $11,982,000 over the value of that made in 1916. This increase appears to be due chiefly to an increase in the quantity of metal produced, but in part to an increase in the price of the metal.

ALUNDUM MANUFACTURE AND USE

A Talk Given at the Ninth Annual Banquet of American Electro-Platers' Society.

By M. A. Williamson, of Norton Company, Worcester, Mass.

HISTORICAL.

Historically, grinding can be considered under two general heads: Grinding as an art and grinding as a science. Webster defines Art as "the application of human knowledge or skill in the formation of things," and Science as "Knowledge methodically digested and arranged." For the sake of convenience, I have defined these two periods as follows: Grinding as an Art, from the earliest days when mankind first started to manufacture tools and implements from stone up to and including the first introduction of artificial abrasives, it has been found that various natural minerals possessed certain characteristics or properties that made them suitable for grinding or abrading either metals or other substances. You will, I am sure, all remember the days of the grinding stone, that good old standby of grandfather's time. This was but a step from the first grinder used, a flat rock, soft in structure, yet made up of hard particles of sand. On such a rock primitive man shaped his implements.

With the introduction of iron and steel, it was found that the older methods of grinding and polishing were too slow, and with the discovery of Emery and Corundrum and the method of making this very much harder material into wheels to replace the old sandstone or fastening the loose grain to circular discs of cloth, leather and so forth, rapid strides were being made toward placing grinding on a scientific basis.

The last steps were taken in this direction when Acheson first discovered, in his early graphite furnaces, some very hard and brittle crystals of a new substance which later became known as Carborundum. At about the same time an employe of the Norton Pottery Works, Worcester, Mass., discovered that it was possible to make solid wheels of emery by mixing the emery grain with certain proportions of clay and burning the entire mass like other pieces of pottery.

In the early part of the twentieth century an electrochemist, Mr. Charles Jacobs, fully conversant with the chemical and physical composition of the natural abrasives—corundum, emery, the ruby and sapphire, which are forms of corundum—started out to make synthetic corundum. In 1900 Mr. Jacobs was successfully melting bauxite in his furnace, producing an abrasive as good as corundum and considerably more pure than the best emery. This new abrasive, if I may call it new, was named Alundum, a trade name coined from the two words aluminum and corundum. This I consider as the last step toward grinding as a science, for, from this time on, knowledge of abrasives has been methodically digested and arranged so that today grinding is one of the principal methods of producing at a comparatively low cost the finest of products in nearly every line of business.

DEVELOPMENT OF ALUNDUM.

So much for history. We will now jump that period during which the process of manufacture of Alundum was developed and refined, and consider its present status with principal reference to the method of manufacture and application. We will also deal lightly with the results of Mr. Acheson's discovery, the silicon carbide abrasive known to the Norton Company as Crystolon, although this product is not of as much interest to you as the Alundum.

The mineral Bauxite, from which Alundum is made, is mined in the southern part of the United States. In its natural state it consists of aluminum oxide, water of crystallization and small amounts of iron, silica and titanium. Before fusing this material in the electrical furnace, the water of crystallization must be driven out. This is done by passing the Bauxite through a rotary calciner heated to about 1300° Centigrade. The calcined Bauxite is then shipped to Niagara Falls, where the furnaces are located.

The furnace used at present consists of a circular steel shell set on a refractory base. Into this shell two electrodes are suspended. The temperature required to melt the Bauxite is about 2050° C. or 3722° F. Each furnace will consume about 300 horse-power per run, producing approximately five tons of Alundum.

The current is turned on and the arc started. Into this arc the Bauxite is shoveled where it is melted and, at the same time, refined. When the shell is full of the molten Alundina Bauxite, the current is turned off and the entire mass allowed to cool. The steel shell is then removed, the resulting pig is rolled off on to the cooling floor where, after sufficient time has elapsed, it is broken up by hand into chunks about 8 to 12 inches in diameter. These lumps are passed through jaw crushers, where they are reduced to pieces about 3 or 4 inches in diameter. From the crushers the Alundum is carried to the storage bins by means of a slow-moving belt and while moving all imperfect or partially fused particles are sorted out.

The rude Alundum, as we will now call it, is sent to Worcester, Mass., where it passes through still further refining operations before being made into wheels or sent out as grain for polishig.

The first operation is crushing the large lumps to pieces about ½ in. in diameter and smaller. The finer Alundum is then passed through rolls and reduced still further. It is then passed over magnetic separators to remove all traces of metallic iron that might be present. The mixed grain is washed to remove the dust and such organic material as might have become mixed with it during its journey from the Falls.

After drying the grain is then sized by passing it over standard power-driven screens. These grain sizes range from a No. 8 to No. 200. The numerol indicating the number of openings per linear inch of screen; as, for example, a No. 8 grain screen had eight openings per linear inch, or sixty-four per square inch.

That part of the grain which is to be used in the manufacture of grinding wheels is sent to storage bins. That which is to be used for polishing is given a still further treatment to remove all traces of dust or other foreign materials which would prove detrimental. This final treatment leaves each grain in such a condition that the glue will hold it firmly on the face of the polishing wheel until it becomes dull, and is either torn away or broken down, presenting new sharp cutting edges.

A polishing or grinding wheel is nothing more than a holder or base on which a large number of small cutting tools, not unlike lathe or planer tools, are mounted. To get the maximum amount of work out of, say, a polishing wheel, each one of these cutting points must be sharp and remain so for varying periods of time, depending on the class of work and so forth. After they have become dull, they must break or be torn away, so that new and sharp cutting points are presented. If these cutting points are of such a composition that they do not fracture easily and the material holding them to

the face of the wheel hard and tough, they soon become dull, and instead of cutting away the metal like a lathe tool, they rub or burn it off. On the other hand, if the binder used is weak and fragile, the dulled grains are torn away rapidly without doing their full share of the work.

Alundum, because of its chemical and physical properties, fulfills the first part of the foregoing description, while the natural abrasives act in general as the quickly dulled cutting points. The reason for this difference is quite plain when you compare the two chemically:

	Alundum.	Emery.
Aluminum Oxide	91.25	67.13
Iron Oxide	2.50	15.54
Silica	1.75	2.72
Titanium Oxide	4.35	3.75
Calcium Oxide	.25	.43
Magnetic Iron	1.25	8.43
Loss in Ignition	.00	2.73

Under the microscope there is a marked difference. The Alundum crystals or grains are sharp and free from iron, while the emery is not quite so sharp and plainly shows the impurities which cause it to give less production and nothing like the length of life of the artificial abrasive.

USES OF ALUNDUM

Time will not permit of going into further details on this subject, as I want to spend a few minutes on the subject of uses of Alundum. Suffice it to say that the process of manufacture of Alundum has been so well worked out that it is not only possible to duplicate from month to month or year to year, within very close limits, the Regular Alundum, but also to make other grades, such as No. 38 and No. 26 Alundum, each having its particular field of usefulness in the field of grinding. In general, Regular Alundum is used in polishing, rough grinding steel and certain classes of cylindrical grinding; No. 38 Alundum, precision grinding, such as internal, surface and cylindrical, of hardened steel parts; No. 26 Alundum, saw gumming and certain classes of rough grinding where the temper of the Regular Alundum is such that finish and production are not quite satisfactory.

In polishing, Regular Alundum has been found to give anywhere from 25 to 500% better service than the natural abrasives. To cite you an idea of the field covered, a few general cases will be cited.

Polishing shovel handles after the blade has been mounted. The material is ash wood and there is some contact with the steel. The grain is mounted on belts 5 in. wide and 5 ft. long. Belts mounted with Alundum are now running three days, and are polishing 150 to 300 dozen handles without burning the wood. Sand was previously used, and sand belts lasted only four to five hours and production was ten to twelve dozen.

A special aluminum article. One polishing wheel mounted with Alundum ground 208. The best results with emery, which was formerly used, were 60.

A demonstration of sand blasting aluminum cups resulted in a reduction in the cost of sand-blasting.

The following cost records reported from a Government arsenal after trying out Alundum for polishing steel parts of rifles showed the economy of using Alundum:

The cost of an Alundum wheel is 12 cents as against $.093 for an emery wheel.

Polishing butt plates—6⅔ emery wheels polished 150 pieces at a total wheel cost of 62 cents, whereas 3⅓ Alundum wheels polished 300 pieces at a total wheel cost of 40 cents.

Floor Plates.—An emery wheel polished 75; an Alundum wheel 150. The cost of polishing 1,000 with 13⅓ emery wheels was $1.24; the cost of polishing 1,000 with 6⅔ Alundum wheels was 80 cents.

Polishing Extractors.—Four hundred were polished with two emery wheels; 400 were polished with one Alundum wheel. One thousand with five emery wheels cost 46½ cents; 1,000 with 2½ Alundum wheels cost 30 cents.

First Polish on Receivers.—Result, 300 with one emery wheel; 600 with one Alundum wheel; 1,000 with 3⅓ emery wheels, cost 31 cents. One thousand with 1⅔ Alundum wheels, cost 20 cents.

On various operations on receivers, Alundum averaged 65% more work per wheel than emery. In operation such as the above, the fact that the use of Alundum is a time-saver should not be lost sight of.

Skates.—On hardened steel runners with grove full length of skate, a severe operation where the wheel is required to hold a good corner, the Alundum wheels averaged sixteen pairs and the emery wheels eight pairs.

On hardened steel flat rubbers after roughed on block wheels covered with walrus hide, Alundum overaged eighteen pairs, emery eight pairs.

Using tandem wheels on machines polishing hardened steel flat runners, six Alundum wheels do the work of twelve emery wheels.

Shaping the points of skate runners, one Alundum wheel polishes 300 pairs, and it requires four emery wheels to do the same work.

In another automobile plant, Alundum was accomplishing from two to four times as much work on polishing connecting rods, cross backs and brass boxes as was formerly accomplished with emery.

In the operation of automobile sockets on canvas belts, an Alundum belt averages 100 sockets as against 50 to 55 sockets on emery belts. Increased production per day amounted to 25%.

A report states that in polishing handles and blades of bayonets, Alundum is much cooler cutting and does not color the blades as much as emery. Production records show an increase which is comparable with other reports.

COPPER ELECTROTYPING.

The February issue of THE METAL INDUSTRY contained an article by Samuel Wein on the subject of copper electrotyping and was a statement of the results of a series of experiments in copper plating conducted by Mr. Wein with his assistant, D. Fromberg. Our attention has been called by the Bureau of Standards and also by the Royal Electrotype Company of Philadelphia to the fact that Mr. Wein's results as published are identical with those given in Bulletin 62, issued by the Bureau of Standards and which were obtained by Dr. Blum, of the bureau at the plant of the company mentioned in Philadelphia. We asked Mr. Wein to explain the situation and he states that we may quote him as follows:

"When I had completed my experiments I was not aware that the United States Bureau of Standards had published the bulletin to which you call my attention. These experiments, while not new (they can be found in most any text book) are merely an elaboration. It seems that I have only corroborated the results of the Bureau of Standards, whose bulletin I saw last week for the first time.

"SOLOMON WEIN.

"New York, March 4, 1918."

EDITORIAL

Vol. 16 New York, March, 1918 No. 3

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With Which Are Incorporated
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FIRE WASTE

The total loss by fire in the United States for 1916, as shown by the bulletin of the National Board of Fire Underwriters' published in this issue of THE METAL INDUSTRY, amounts to an appalling figure. It is considerable of a shock to learn then that the figures for 1917 are even higher! The National Council of Defense has taken up the matter and points out that the 1917 fire losses exceeds that of any year except that of the San Francisco fire. The National Council urges the State Councils to "renewed effort and more energetic remedies" against fires. It suggests "constant watchfulness, extra guards, frequent inspection and the proper care and segregation of all inflammable waste."

The reported total of $230,000,000 of fire loss last year was just that much taken out of the wealth of the nation, a sizable tax on everyone in this country. Destruction due to the incendiary match or the plotter's bomb is a war hazard. Destruction due to cigar and cigarette butts, carelessness with matches, improper electric wiring, flimsy curtains near gas jets, reckless storing of oils and gasoline, factory and domestic rubbish heaps, is little short of criminal. Proper precautions, industrial and domestic, against fire should be treated as a highly important kind of war conservation.

PLATINUM SHORTAGE

According to dispatches from Washington it is the understanding of officials of the American Government that Germany is now using every means at her disposal to obtain all the platinum from Russian sources. It is the official opinion that while Germany is badly in need of the metal herself she is also taking advantage of the peace negotiations in order to buy up the platinum in order to keep it away from the allies and the United States.

Competition for platinum among the nations of the world has become one of the keenest commercial struggles of the war. It is well known that platinum and its sister metal iridium affect the war most vitally, for without them munitions and many kinds of delicate electrical instruments cannot be made. Tanks cannot move without these metals, for contact points of magnetoes and signal instruments are dumb from the want of them.

The supplies of platinum in this country are between 25,000 and 50,000 ounces, most of which will be taken over by the Government under the commandeering order issued the week of March 2, 1918. However, the main point at issue now is to get enough iridium or some other alloying metal that will harden platinum. We need not worry about the platinum supply, for we know the people of the United States of America will only be too glad to turn over to the Government all the platinum jewelry they have should it be needed to win the war.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

OUR ENGINEERS IN FRANCE

A Plea for the Liberty Loan. The Third Loan Will Be Offered April 6, 1918.

To the Editor of The Metal Industry:

Four American soldiers who had returned to the United States to recover from sickness contracted while serving at the front with engineer and hospital units, sat in a room of the Administration Building of the Army Hospital at Fort McHenry and discussed the problems that confront those who are doing pioneer work "Over There."

Naturally, much of their conversation turned on engineering problems. Especially, it concerned the building of railroads in France.

"Our people over here," remarked Sergeant E. S. Hartshorn, of Company A, Twenty-ninth Engineers, "have not the slightest comprehension of what we are up against in France. They know that we are building railroads under difficulties. They read of our being under fire while part of the work is performed, and yet they have not the slightest idea of what the work itself is; what it costs and what it must cost in money, as well as in lives."

"No," added Private Robert Lee, whose services ended when a work train ran over him and permanently injured his spine, "and they can have no idea how imperatively necessary this work is. The establishment of proper rail communication is one of the greatest problems that the Allies have to face. The Germans behind their lines have splendid railroad facilities, the result of years of forethought and preparation. This gives them an immense advantage in the movement of troops. This has been shown over and over again, but particularly in the Italian campaign when both sides wanted to get more soldiers to that front. The Allies had to get their men there by the most roundabout ways, while the Germans just poured reinforcements in by rail.

"It is not merely that new lines have to be built. That in itself is a man's size job when you consider that most of the track has to be laid over shell wrecked terrain and often under fire. But in addition, there is the fact that every piece of existing line has to be converted from single to double track. I believe it was one of the conditions of peace after the war of 1870 that all of the railroads in that part of France in which the present war is being fought must be of single track. Germany was not taking any chances, and she has been justified by the event."

The sergeant took up the conversation. "This building of railroads is particularly American business," he said. "We know how, and the French know that we know, and look to us to assume this work. And remember that it is not just a question of building lines to the front. That may be the most costly and the most spectacular feature of the work, but actually we have to spread a network of rails from one end of France to the other."

Pte. Jack Lydon, formerly of the Fifth Base Hospital (Harvard Unit) who knows what it means to work in a hospital which is being bombed by German airplanes, submitted his side of the case for big expenditures.

"When I first reached France," he said, "I wondered where all the airplanes came from. I could not imagine that the Allies could use all that I saw. But it did not take me long to realize that we had not half enough. All kinds of money must be spent to augment the air fleet for the enemy is building planes at an astonishing rate. Ambulances are also needed urgently. Many lives are lost in getting men who perhaps have lain for a day or two days in No Man's Land from the dressing stations to the base hospitals. The need can only be understood by one who has worked in hospitals at the front."

"That is the situation with regard to all these matters," said Pte. George Langford. "If the American people only knew, there would be no need for a Liberty Loan campaign. It would be necessary only to announce that the money was needed and it would pour in without solicitation. The soldiers know. They are willing to give their lives if necessary, and yet, with conditions open before them they realize that money is needed even more than men. That is why they are all heavy subscribers to the Liberty Loan. Ask Bob Lee here what his regiment did."

The crippled Engineer took from his pocket a little memorandum book, and read from it the purchases by companies. The six companies bought 1,958 $50 bonds of the Second Loan.

That is what the men in khaki who risk their lives are doing. Can any of us do less?

John Price Jones,
New York, March 2, 1918. Liberty Loan Committee.

TINNING BRASS CARTRIDGE CASES

To the Editor of The Metal Industry:

We have noted on page 74 of your issue of February, 1918, an article under the above heading. At the bottom of the first column we note a description of the use of Epicassit as a second method, and in this it is stated that there is used "an oil flux, such as petrolatum or a mixture of petroleum and palm or cocoanut oil."

This is an error, since the flux that is employed is a special one, furnished by us with the Epicassit powder. While it is not impossible that a flux such as described may give results on occasions, these are apt to be very decidedly inferior and are the cause of much trouble. If the coating was still in a molten condition and is to be wiped for the purpose of smoothness and brilliancy, the use of vaseline or almost any sort of fat or oil on a piece of chamois, or very soft leather, will answer. For this purpose ordinary oil or mutton tallow, or petroleum, cocoanut oil, palm oil, etc., will serve.

HESS & SON, Manufacturers of Epicassit,
By Henry Hess.
Philadelphia, Pa., March 2, 1918.

NEW BOOKS

Refractory Materials.—Their Manufacture and Uses—By A. B. Searle. Size 6½ by 9 inches. Bound in boards. 444 pages including index. 135 illustrations and numerous tables. Published by J. B. Lippincott Company. For sale by THE METAL INDUSTRY.

This work, which was commenced by the author in 1913 and completed in 1914, but whose publication has been delayed until the present time due to the war, will be welcomed most heartily by those engaged in the melting of metals or their heat treatment. As this is practically the only book of recent date to be devoted solely to the manufacturing and properties of fire bricks, retorts, crucibles, and so forth, used in metallurgical, engineering, chemical and other industries, it proves a most valuable adjunct to such business.

Few people realize that most every important business is dependent upon the use of refractory materials. Without them no steel, brass or other technically valuable metals or alloys could be reduced, no furnaces could be constructed and the use of gas and electricity as sources of power would be impracticable.

It is with the foregoing in mind that this work has been undertaken and it only needs a casual going over of the book to convince anyone that the author has amply fulfilled his ambition in its preparation. The book is made up of eighteen chapters which are devoted to the following subjects: The Raw Materials, the Manufacture of Firebricks from Clay, Silica Firebricks, Basic Bricks, Including Magnesia, Dolomite, Lime, Baryta and Basic Slag Bricks; Bauxite and Other Highly Aluminous Bricks, Carbon Bricks, Bricks Made of Chromite or Iron Ore, Carbide and Carboxide Bricks, Refractory Blocks, Slabs and Hollow Ware; Saggers, Muffles, Crucibles and Scorifiers, Glass Pots, Retorts, Fused Silica Ware, Refractory Porcelain, Refractory Mortars and Cements, and the Selection and Application of Refractory Materials.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

BURNISHING

A.—We had a tumbling barrel for burnishing nickel-plated chain and obtained fine results. We used the barrel for burnishing a few batches of copper-plated chain and find that now all our nickel chain turns dark after it has been in the barrel a few minutes.

A.—If nickel is tumbled in a solution that contains any ammonia or any of the copper salts, the nickel will turn dark. We would suggest that you wash the tub with a strong solution of sal soda, then use a castile soap solution for burnishing.—O. A. H. Problem 2,546.

CASTING

Q.—I am casting aluminum pulleys with iron hubs in them and very often the aluminum hub around the iron will crack wide open. Is there a special mixture to prevent this? I am using aluminum 93 to 94 per cent and copper 6 to 7 per cent. I am putting a coating of clay wash on the hubs and heating the iron before casting. Is there a better plan than this? What is the best way of gating pulleys? I am gating from the hub.

A.—The high degree of shrinkage of the aluminum alloys on solidifying is the cause of the cracking of your castings. Heating the hubs quite hot will reduce the danger of cracking. The temperature of the hubs and the temperature of the aluminum alloy when poured should be controlled by a pyrometer.

Attempts have been made to reduce the shrinkage of aluminum by the addition of various alloying metals. An alloy of 7 per cent of cadminum with a small amount of manganese has been recommended, also an alloy of 2 per cent of tin and 8 per cent of copper. The straight aluminum copper alloys are quite strong when solidifying and strong when at high temperatures, so they are gentrally used if it is desired to avoid high shrinkage. As the copper increases from 8 to 15 per cent the shrinkage is gradually lowered. Hence you might increase the amount of copper in your allow somewhat. Clay wash and gating the hub are very good practice.

In making malleable iron bicycle sprocket wheels, it is necessary to remove the castings from the mold as soon as they are set and allowed to cool down slowly. A similar plan could be followed with your hub castings.—J. L. J. Problem 2,547.

CLEANING

Q.—What is the best method of cleaning old auto radiators for repairing (soldering) on and between the tubes by local application, if possible, or by the use of a bath, as it is very difficult to remove dirt and corrosion clean enough to solder?

A.—Local application would not prove a very satisfactory method of cleaning old auto radiators previous to soldering. The best method would be to use a tank so that the radiators could be immersed entirely in the cleaning solution. The solution should consist of about 8 ounces of mineral cleaner per gallon of water and should not be used at less than 180 to 200 degrees.

After immersing in the mineral cleaner for a short time remove and wash well with water, using a hose for the purpose, so that the dirt will be removed from the crevices of the radiator by the force of the water.

After the above operations another tank should be arranged, and can either be the same size as the mineral cleaner tank or half the size, as half of the radiator can be cleaned at one time in the acid solution. The solution consists of equal parts of muriatic acid and water. A small amount of scrap sheet zinc may be dissolved in the mixture, as it will help to produce a clean white surface on the iron.

After cleaning the rust from the radiator, wash in cold water. If the radiator is not going to be re-soldered immediately immerse in the mineral cleaner again and let the radiator dry without rewashing in cold water. The cleaner will prevent the radiator from rusting until such time as you are ready to do your soldering.—C. H. P. Problem 2,548.

FINISHING

Q.—We would like a formula for a rose gold solution without the use of gold.

A.—The nearest approach to a rose gold finish without the use of gold would be to use a cyanide copper solution that will give a smut, and then relieve and flash in a hot dilute brass solution. This method will give a very good imitation gold finish.

COPPER SOLUTION.

Water	1	gallon
Sodium cyanide	3	ounces
Copper cyanide	2½	ounces
Soda ash	3	ounces

DILUTE BRASS SOLUTION.

Water	1	gallon
Sodium cyanide	2½	ounces
Copper cyanide	1½	ounces
Zinc cyanide	½	ounce
Soda ash	1	ounce
Sal ammoniac	¼	ounce
Sodium arsenate	2	grains

Use a temperature of 120 degrees Fahr., and possibly half the proportions given will give good results, and the cyanide may also be slightly increased.—C. H. P. Problem 2,549.

Q.—Can you give me some information regarding a dip for a Jacobean finish on brass?

A.—As the term "Jacobean finish" upon brass is only a trade term, it is difficult for us to determine what the finish really is. There is a cloister bronze which is nothing more than a dark bronze finish upon copper of copper-plated surfaces. Either polysulphide, the substitute for liver of sulphur, or sulphide of barium may be used in producing this finish. About ¼ to ½ ounce of either material in a gallon of water, with a little ammonia added, will give results. The articles should be scratch-brushed dry and finally lacquered.

The Jacobean finish may possibly be a dark brown finish upon brass and afterwards rubbed down with wet sand so that the brass shows through the dark finish. To produce the finish scour down the articles as you would for brush brass, cleanse as usual and immerse in a solution of polysulphide, 2 ounces per gallon of water heated to near the boiling point. A little ammonia may be added. The results from this immersion will be a deep gold color upon the brass. Remove the articles, wash and immerse in a cold solution of 1 gallon of water and 4 ounces of sulphate of copper. The gold color of the brass will turn to an olive green brown, remove the articles, wash dry and scratch-brush. Afterwards rub down with the sand, as noted above.

If the finish is not dark enough after the first immersion, repeat it. The ammonia carbonate of copper solution is frequently used in producing these antique brass tones, especially when they are used slightly warm, so that dark brown tones are produced instead of black. For the brown tones an excess of ammonia must be avoided.—C. H. P. Problem 2,550.

MANUFACTURING

Q.—We have been called in by a local manufacturing concern to specify for the ventilation of a certain department in their factory. The problem is to overcome and eliminate from the room nitric acid fumes. All apparatus used here previously has been eaten up by the acid fumes and they are desirous of putting in something of a permanent nature. We know that lead would be impervious to the effect of the acid, but it is impractical to build our ventilators of lead because of the great weight. It

has been suggested that the ventilators be built of copper and plated or coated with lead. The information that we are desirous of obtaining from you is whether it is possible to plate lead on copper and if so how it can be done?

A.—The process of lead plating has very little application commercially. It has been used by Betts in the refining of lead. The anodes are crude lead and the electrolyte lead fluosilicate solution. By adding a small amount of glue, a dense, smooth deposit is obtained.

I doubt very much if you do succeed in obtaining sheet copper lead plated, whether it will be of much value for a ventilator. If any pinholes are present, the ventilator would be corroded very rapidly as the lead and copper would then form a galvanic couple. If you wish to try a lead coated metal why not try terne plate? It is sheet steel coated with lead containing a little tin. Or you could coat sheet copper with solder by dipping it into the molten solder.

A plan that has been followed with considerable success has been to construct the ventilators of sheet iron and then coat them with coal tar very heavily.

For the heavy nitrous oxide fumes that come from bright dipping jars, the writer prefers a down draft. By setting the jars in a lead-lined tank around the top of which runs a lead-lined conduit with suitable openings, a very satisfactory arrangement is secured. The draft can be supplied by a lead-lined exhaust fan.—J. L. J. Problem 2,551.

MOLDING

Q.—I have a small figure in soft metal which I desire to reproduce in bronze. I took this figure to a local foundryman, but he was unable to make a copy of same owing to the fact that the model is very much undercut and he could not pull it from the sand mold. He told me he could pour the metal for me if I made the mold.

I understand how to make a piece mold, but want you to advise me what material is used in making the mold. Plaster of paris, I understand, will not hold the fine lines under heat. Kindly advise me what material is used to make the molds for small figures, such as sculptors use in getting a smooth finish and fine details of art casting.

A.—In doing an odd job, such as you have in mind, French molding sand, if it can be obtained at the present time, will prove a satisfactory material. The number of separate draw-backs or parts required in the mold will depend upon the amount and locations of the undercuts in the figure. For a parting material, use lycopodium, dusting it on the mold from a small bag. The mold should be covered with damp cloths while work on it is in progress, to prevent the sand drying out. The core can be made of such a size that any desired thickness may be obtained in the finished figure. The smooth parts can be wrought with a scraper or graving tool if desired, as castings that are small are seldom left as they come from the mold. The figure can then be copper plated, colored to any desired shade and lacquered.—J. L. J. Problem 2,552.

PLATING

Q.—We would like to obtain a good nickel plate on aluminum rod similar to that obtained on nickel-plated aluminum mirrors.

A.—The most successful method developed in nickel plating aluminum is to arrange a double throw switch on the nickel tank so that when articles of aluminum are to be plated they can momentarily be made the anode or positive factor.

The action of the reversed current dissolves the oxide upon the aluminum surface which, according to authorities, is the difficulty of nickel plating aluminum successfully. As the oxide is reduced in the nickel solution without exposure to the atmosphere the nickel deposits successfully when the current is again reversed to negative.

A small tank could be arranged especially for the purpose of preliminary plating aluminum as outlined. The articles so plated could then be plated in the regular nickel solution as long as the aluminum was protected from oxidization with the film of nickel.

It is, of course, understood that articles made from aluminum plated in this manner should be first cleansed from grease and organic matter.—C. H. P. Problem 2,553.

Q.—We had a quantity of chloride of silver which we intended to use for a large silver solution. Through an oversight the chloride was allowed to dry and about one-fourth has turned purple. Can we use this for making a cyanide solution? Will any special chemicals be required? What makes some new silver solutions turn coffee colored while others remain clear? Does a dark silver solution work just as good as a colorless one?

A.—When chloride of silver (Ag Cl) is exposed to strong daylight it is converted into the purple subchloride ($Ag_2 Cl_2$). As the subchloride is soluble in cyanide solutions it can be used the same as ordinary chloride.

If chloride of silver is added to a concentrated cyanide solution spontaneous dissolution takes place with sufficient development of heat to convert some of the silver into the brown argentous hydroxide Ag (O H) and the brown argentic oxide Ag O. The silver hydroxide dissolves in a few hours but silver solutions sometimes contain copious precipitates of argentic oxide after being used for several days. The formation of the oxide can be prevented by mixing a small amount of aquaammonia solution with the wet chloride of silver before it is added to the cyanide solution. The chloride should always be added slowly accompanied by constant stirring. The undissolved precipitate is no more prejudicial to the proper working of the solution than any other form of dirt or sediment.—O. A. H. Problem 2,554.

REFINING

Q.—Is there any known commercial method whereby tin can be separated from lead in a tin-lead alloy?

A.—Various chemical methods are known for separating tin from lead and the high price of tin and the demand for it in a pure form may result in the working out on a commercial basis of methods similar to the electrolytic refining of copper, zinc, etc. Concentrated sulphuric acid dissolves tin-lead alloys leaving the lead as insoluble sulphate. Nitric acid to which a little hydrofluoric acid is added, is a good solvent for tin and lead and the lead can be separated electrolytically as peroxide.

The method that is commonly used commercially for working up such alloys, is to charge them into a sweating furnace where they are melted at the lowest possible temperature. The liquidated metal runs into a kettle heated by a separate fire and it is further refined by plunging sticks of green wood under the surface. The steam and gases evolved agitate the metal vigorously and cause the impurities to gather on the surface in the form of dross. Billets are cast from the refined metal and the amount of tin and lead present are ascertained by means of a special balance. By adding lead or tin as required the various grades of solder can be made.

If antimony or copper are present they remain behind in the sweating furnace and can be scraped out, melted in crucibles and used for making babbitt or brass.—J. L. J. Problem 2,555.

SOLDERING

Q.—We wish to obtain a first-class solder that will take nickel plating. We are using a solder now that after the work is nickel plated the solder turns very dark and dirty, which, of course, does not make a very nice appearance.

A.—Three trial sheets of copper were prepared and half of each sheet tinned, the other half being left untinned. The first sheet was tinned with a solder composed of lead 66⅔, tin 33⅓; the second with a solder composed of lead 58, tin 42; the third with a solder composed of lead 20, tin 80. All three sheets were nickel plated in the usual way, the cleaning being done with one of the commercial cleaners which consists of soda ash and infusorial earth. One side of each sheet was buffed and the other left just as it came from the plating solution. In no case did the solder turn black and dirty.

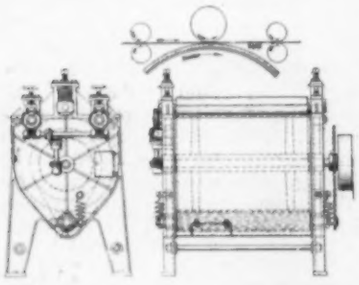
It is likely that you have been using caustic soda or caustic potash for cleaning your work. In cleaning alloys that contain much lead, tin, antimony, zinc or aluminum, caustic should not be used as it strongly attacks these metals, leaving behind a dark residue of the metal or metals that are least soluble. By using a milder cleaner or by scrubbing off this residue, your difficulty should cease.—J. L. J. Problem 2,556.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,253,675. January 15, 1918. **Sheet Metal Polishing Machine.** H. D. Euston, Quincy, Mass.

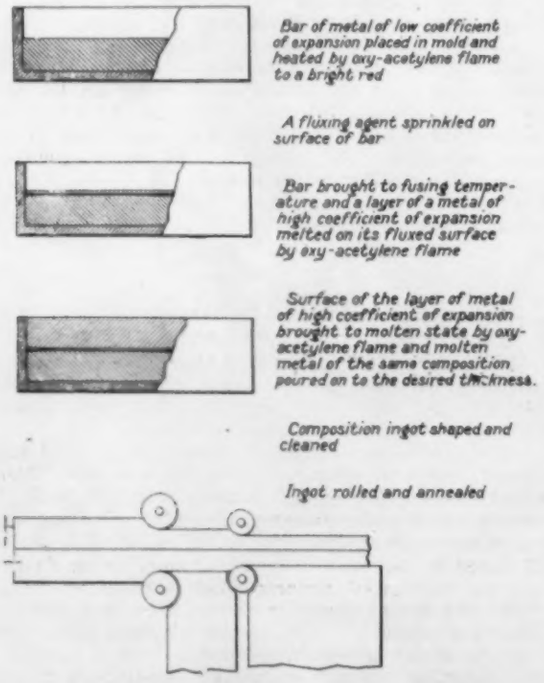
This invention relates to a polishing machine, as shown in cut, wherein a drum covered with felt, said felt being charged with a suitable abrasive such as pumice, is rotated against a sheet metal plate, said plate being backed up by an idler roll, and fed over the felt covered drum by two sets of feed rollers. These feed rollers and the idler roll have suitable means of adjustment by means of which the amount of pressure between idler and drum may be regulated and by means of which the distance between feed rolls can be changed to compensate for different thicknesses of plates.



The invention particularly relates to a machine for polishing sheet copper such as used in the engraving art and is used preferably on plates which have been planished on a planishing machine, the details of which were described in a previous application.

1,250,612. December 18, 1917. **Process of Making Composite Bimetallic Articles.** William H. Miller, of Fort Wayne, Ind., assignor to the General Electric Company, a corporation of New York.

This invention relates to a process of making composite bimetallic articles, and in particular to a process, as shown in cut, of uniting two dissimilar metal bodies having relatively different coefficients of expansion. Specifically,, the invention relates to a process for the manufacture of thermostatic metal.



The most sensitive thermostatic metal is obviously obtained by employing two dissimilar metals or alloys whose relative difference of coefficience of expansion is the greatest. Practically, the use of a special nickel-steel alloy having a relatively low coefficient of expansion and of a leaded brass having a relatively high coefficient of expansion has been found very satisfactory. Since it is difficult to roll a leaded brass, the inventor has found it desirable to use a lead-free brass when the composite metal is to be subjected to a rolling operation, although the coefficient of expansion of a lead-free brass is relatively lower than that of a leaded brass. Thus, in carrying out the invention, he prefers to use the special nickel-steel alloy known as invar whose composition is substantially as follows:

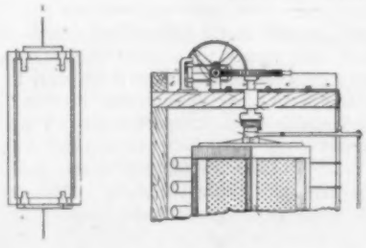
Nickel	35.5%
Carbon	.18%
Manganese	.42%

The remainder being pure iron.

1,254,046. January 22, 1918. **Mechanical Plating-Machine.** W. R. King, Newark, N. J. Assignor to the Hanson and Van-Winkle Company of the same place.

This invention relates in general to electroplating and analogous operations and in particular to apparatus for plating articles in bulk.

Where the work upon which the plating is to be performed is in the form of small articles to which individual contacts cannot be readily applied, plating barrels as shown in cut, and similar apparatus are employed, in which contact with the work is made by its resting by gravity upon suitable cathode elements, and the parts are usually kept in motion so as to bring a constantly varying surface of the articles into contact with the cathode members or into contact with work pieces which receive current from them, and in this way a distribution of the plating over the entire outer surface of the work piece is accomplished. In those forms of rotary barrels heretofore employed, the anodes have been disposed in a plating vat outside of the work receptacle which revolves therein and the cathode elements have been disposed on the inside of the work receptacle, the receptacle being provided with porous or permeable walls through which the circuit from anode to cathode was maintained by the electrolyte.



The object of the invention is to improve the current path and to obtain a better presentation of the work while at the same time increasing the efficiency and output of the apparatus.

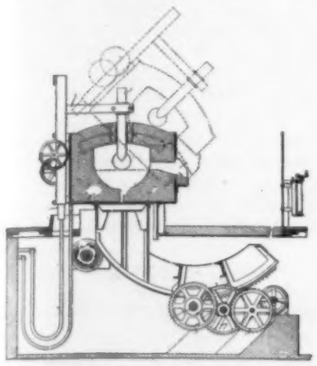
1,254,263. January 22, 1918. **Rust-Proofing Iron and Steel Surfaces.** W. I. Oescher, Detroit, Mich. Assignor to Parker Rust Proof Company of America of the same place.

This invention relates to a process of forming non-corrodible protective surfaces on articles made from iron or steel, or alloys thereof, and to the production of the materials to be used in such process, and has for its object certain improvements in the method of treating said articles and in the compounds or materials used to produce permanent surfaces, which, while not injuriously affecting the ferrous masses, will retain their efficiency as a protective medium against the action of the elements of the atmosphere.

The articles of iron and steel to be treated are placed in a bath which is usually kept at about the boiling point, but the exact temperature and the proportioning of the constituent elements of the bath are determined by the metallurgical character of the articles to be treated. The preferrd composition of the bath is about 98 per cent. of water and less than two per cent. of a metallic phosphate such as the acid meta-phosphates of tungsten, molybdenum or of any of the metals of the third, fourth and fifth groups, according to the analytical classification (set forth by Prof. G. S. Newth, F. I. C., F. C. S., in the eighth edition of his "Manual of Chemical Analysis," published by Longmans, Green & Co., New York.

1,254,077. January 22, 1918. **Electric Furnace.** F. T. Snyder, Oak Park, Ill.

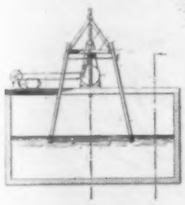
This invention relates to an electric furnace, and more particularly to a tilting furnace. Its object is to provide a furnace of this type in which the ladle or the like into which the metal is poured from the furnace can remain in a fixed position during such pouring irrespective of the particular position to which the furnace is tilted. Another object is to provide a furnace, the tilting of which is easily and readily controlled and in which the operator is enabled to look directly into the furnace through the pouring spout and thereby to know just to what extent the furnace should be tilted during the pouring. A further object is to provide a furnace having a maximum capacity with minimum heat radiation.

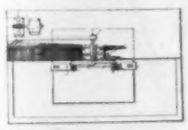


The several features of the invention designed to carry out the before-mentioned objects of the invention may be more readily understood by references to the accompanying cut.

1,254,751. January 29, 1918. **Etching Machine.** C. N. Wendelglass, Buffalo, N. Y.

This invention relates more particularly to a machine for etching plates for printing purposes although the same may also be used for etching other plates or articles.





The object of this invention is to provide an etching machine, as shown in cut, for this purpose which permits etching plates of various sizes to be operated upon, which is simple in construction and capable of being readily fitted to the ordinary band-etching tanks commonly in use; which is rapid and even in its operation and which may be produced at comparatively low cost.

The patent covers:

A plate etching machine, comprising a tank adapted to contain an etching-solution, a vertically-reciprocating slide, two levers pivoted on said slide and each having a lower arm and an upper arm, the lower arms of both levers being adapted to receive the plate to be etched between them, a sleeve movable vertically on said slide between said levers, links connecting said sleeve with the arms of said levers, and a clamping bolt connecting said levers and operating to press the lower arms thereof against opposite edges of said plate.

1,254,854. January 29, 1918. **Composition of Matter.** F. T. Schuller, Minneapolis, Minn.

This invention relates to a composition of matter comprising a new and useful combination or alloy of aluminum with certain other metallic ingredients whereby the aluminum is rendered tough, resilient and malleable and not subject to fracture. Natural aluminum is light and strong but cannot be bent and beaten or forged to advantage because of its extreme brittleness and liability to fracture. Yet, because of its lightness it is a desirable substitute for steel for many purposes. It is the particular object of the invention to produce a metallic alloy of aluminum which will retain the lightness and resistance to oxidation of the pure metal and have qualities of toughness, resiliency and pliability which fit it to be used as a substitute for steel where a light structure is demanded, particularly in connection with certain types of vessels such as submarines, and in flying machines.

The patent covers:

A composition of matter consisting of aluminum, tin and phosphorus incorporated and combined in proportions of ninety-six to ninety-eight per cent of aluminum, three and three-fourths to one and eleven-sixteenths per cent. of tin, and one-fourth of one per cent. to three-sixteenths of one per cent. of phosphorus.

1,254,987. January 29, 1918. **Alloy.** H. S. Cooper, Cleveland, Ohio. Assignor to the Cooper Research Company of the same place.

This invention relates to an improved alloy, comprising aluminum and beryllium, and the object is to combine these metals in suitable proportions to provide an alloy of superior properties and characteristics compared with other lightweight metal alloys in use or known at the present time.

An alloy prepared by melting together the two metals named is much stronger than aluminum alone; it is harder and possesses a higher melting point than aluminum alone, and is from five per cent. to thirty per cent., lighter, depending upon the amount of beryllium contained.

1,256,084. February 12, 1918. **Method of Plating Ferrous Metals.** W. E. Watkins of New York, N. Y. Assignor to the Metals Plating Company. A corporation of New Jersey.

This invention relates to the plating of one metal, such as iron or steel with another, such as tin, and consists, broadly stated, in the employment of a finely ground oxid or salt of tin to form a coating for the ferrous metal and then subjecting the metal, so coated, to a temperature at or above the melting point of the plating metal and sufficient to raise the ferrous metal to approximately its welding heat. As a result the oxid or salt, whichever is used, is reduced and a continuous plating of the metallic base thereof is deposited on the surface of the ferrous metal in a molecular union therewith, while an exterior layer containing a magnetic oxid of iron is formed on the plating metal which protects the same from oxidation during the cooling of the plated article.

For preparing the coating material the inventor says:

"I first grind a quantity of oxid of tin, or of one of the salts of tin, such as chlorid of tin to great fineness in a suitable inert, viscous, volatile vehicle such as a mixture of equal parts of Mexican crude oil and an American fuel oil. In practice I am using about 40 pounds of the tin oxid or salt for every 8 gallons, or approximately 64 pounds of the oil mixture, but these proportions may be varied to produce plating films of different thicknesses. I then apply this viscous mass in an even, dense coating to the ferrous metal to be plated. In the case of sheets I pass the same through rolls which are coated with the plating material. Such plating material can also be applied, though less advantageously, by brushing or pouring it on, or by dipping the article in a plastic mass of the oil and chlorid mixture."

1,256,285. February 12, 1918. **Solder for Aluminum.** John J. Aurbertin, Jr., St. Louis, Mo.

This invention consists in an improvement in solders for uniting aluminum, and can be used not only for uniting two parts both made of alumium but, also, two parts one of which is aluminum and the other of some other material, as for instance, brass or copper.

This present solder is compounded as follows, the ingredients being in substantially the proportions herein named:

One-half (½) pound of zinc is melted and thereupon one-half (½) pound of block tin is added thereto. The zinc and tin are thereupon thoroughly mixed by stirring or any other suitable form of agitation, the greater heat necessary for melting the zinc and, at the time of mixing the tin with the zinc still remaining in the zinc being adequate quickly to melt the tin. Two (2) drams of sal ammoniac are then added to the fluid mixture and the sal ammoniac is thereupon thoroughly mixed with the said fluid mixture by stirring it well. The mixture, is then allowed to flow away from the heat or poured out and solidifies in ingot form. After this solidification the blocks or ingots are re-melted in a furnace. The fluid mixture is then poured into suitable molds in strips and allowed again to solidify.

In use it is unnecessary to employ a flux to produce a flow of this solder, which is an advantage over previous solders for aluminum.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

THE MAXON PREMIX BURNER

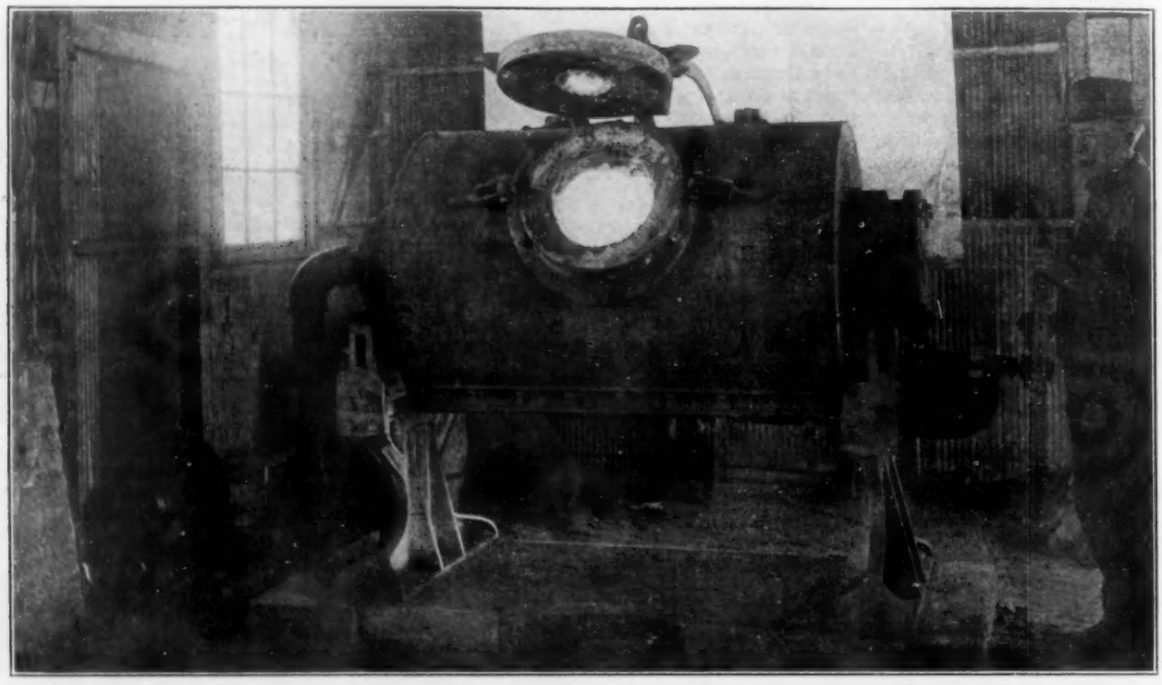
By R. W. McCandlish

DESCRIPTION.

The Maxon Premix burner, shown in the several cuts accompanying this article, embodies the principle of mechanically mixing air and gas for combustion in the simplest possible form. A simple air and gas valve is fixed on the inlet of a small electric motor-driven blower. The motor is directly connected to the blower and is of a constant speed. The air and gas is taken into the blower in any proportion that is desired; and is thoroughly and intimately mixed by the fan traveling at the rate of 3,600 r. p. m. This mixture is then driven forward to the point or points of ignition at a speed in excess of the speed of flame propagation. Multiple or single nozzle headers may be attached to the discharge of the burner to obtain any desired distribution of fire in the furnace to be heated.

APPLICATION.

In many cases existing header systems on furnaces, fired by other methods, may be used. Where this is impractical special headers can be very simply constructed with pipe and firings. The Premix is applicable to any form of oven or muffle type heat-treating furnace, and to high-speed steel-treating furnaces A separate Premix is installed on each furnace giving each furnace its own air plant and making it a complete and self-sufficient unit.



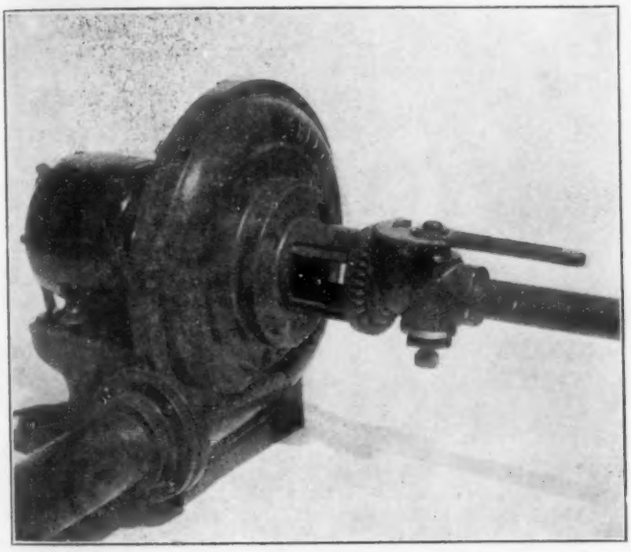
THE MAXON PREMIX BURNER FITTED TO A MONARCH OIL FUEL METAL MELTING REVOLVING FURNACE.

THE MAXON PREMIX BURNER ON PIT CRUCIBLE FURNACES.

ADVANTAGES.

There are three principal advantages that may be claimed for this burner:

The proximity of the Premix to the furnace on which it is installed cuts the air losses due to friction to the minimum. The fact that only that amount of air necessary for the complete combustion of the gas is allowed to pass through the Premix makes it possible to utilize a greater portion of the motor's energy for useful work than it is possible to do with other systems supplying air for the combustion of gas. By making each furnace a Premix unit it is not necessary to operate a central air plant ordinarily used for a number of furnaces when it is desirable to operate only one or two small furnaces. In one instance that I think of, four No. 1 Premixes equipped with ⅛-horsepower motors displaced a 5-horsepower-driven blower; ½-horsepower now does the work formerly done by 5 horsepower. This is unusual, but in the majority of cases a 50 per cent. saving in power may be effected by the displacing with Premixes of central air stations supplying air for several furnaces. The elimination of large motors and blowers, elaborate air distribution systems and complicated gas controls and valves makes the installation of Premixes economical. Fuel savings are dependent upon the installation and upon the operator. Perfect combustion can be obtained with the Premix, but even a perfect fire can be wasted. The virtue of any gas burner installation lies about 75 per cent. in the application of the fire obtained, and only about 25 per cent. in the fire itself. A slight saving



THE MAXON PREMIX BURNER.

of fuel will be realized in any installation of Premixes, due to the superiority of the character of combustion obtained by the premixture of air and gas to other methods of obtaining mixtures for combustion.

The second advantage derived from the use of Premixes is the fact that constant furnace conditions may be obtained with the Premix burner. The elements controlling the character of fire desired in a furnace are as near constant as it is possible to make them. The motor is of a constant speed and the gas pressure conditions are very nearly constant, providing the consumer has seen to it that his meter plant and distribution system is of sufficient size for his needs. Therefore any desired furnace condition can be constantly maintained by the use of Premixes, and this fact will appeal to you without any further discussion.

The third advantage derived from the use of Premixes is that incidental to the use of the ratio valve feature. By means of this combined gas and air inlet valve the proper proportions of both gas and air are automatically obtained. The operation is so flexible that once the adjustment is made, a pre-determined mixture of gas and air in the correct ratio is instantly available. The rotary sleeve over the air ports is turned simultaneously with the opening of the gas valve, and the gear teeth between the lever and the sleeve constitute a graduated adjustment of the air intake. Hence by means of one common lever control, a fixed amount of gas is proportionately admitted with the quantity of air necessary for combustion. Because of this mechanical one-lever control, even the most unskilled workman may secure correct combustion at any rate of gas consumption. The Maxon Premix burners are manufactured by the Maxon Premix Burner Company, of Muncie, Ind.

TINNING OF CAST IRON

By Henry Hess, of Hess and Son, Philadelphia, Pa.

In the February issue of The Metal Industry we note an article under the above heading.

We are much interested in this and we think that "CVH," the author of the article, as well as readers of The Metal Industry generally, will be in turn interested in knowing that they can tin cast iron at a very much less expense for apparatus, etc., than is involved by the dipping method, and also at a very much less expense for metal. Moreover the following method will allow the coating of one side, or even of local places, without affecting the remaining surfaces.

The metal is prepared for the reception of the coat as has been suggested by "C. V. H.," who is entirely correct in his statement that the characteristics of cast iron in accepting a coating vary very greatly. Assuming that the iron has been suitably prepared and cleaned, Epicassit, a tinning material, is painted or sprayed on. The article is then heated to the melting point of Epicassit.

In case the article is rather bulky or requires considerable time to heat, then it should be heated before the application of the Epicassit and this latter should then be sprayed on, melting as it comes into contact with the metal.

Epicassit has been mentioned above, and not merely tin, this for the reason that Epicassit coating may be either pure tin or pure lead or alloyed with zinc, or may be an alloy of any two or three of these in any desired proportion. The standard brands are:

Brand A—pure tin.
Brand B—66 parts tin, 33 lead.
Brand C—33 parts tin, 67 lead.
Brand Cn—5 parts tin, 95 lead.
Brand E—35 parts tin, 15 parts lead, 50 zinc.

For spraying these metals, any of the ordinary spraying apparatus on the market that will take fairly heavy paint or varnish will answer. Epicassit consists of very finely pulverized metals and a proper quantity of fluid, the two being mixed at the time of use.

As to apparatus that is required, this may range from that costing a few dollars to any degree of elaboration, depending upon the industrial purpose and the quantity of work to be done. For heating, anything from an open bunsen burner to any type of muffle or other furnace will answer. As only just sufficient metal is employed to cover the surface and no metal bath is used, the economy of metal is very decided.

A further very unique use lies in the fact that several coatings may be applied. For instance, a zinc coating may be applied to one surface and then a tin coating may be applied to another, or the tin coating may be applied on top of the zinc coating. This is made possible by the fact that zinc melts at a temperature around 800° F., and tin at a temperature around 400° F., and further by the possibility of local applications.

NEW PLASTIC CEMENT

EQUIPMENT.

"Pecora Heatpruf" is the name of a plastic cement manufactured by the Pecora Paint Company, Fourth and Erie avenue, Philadelphia, Pa., for use in lining new furnaces and heating devices of all kind, and for bonding, patching and protecting furnace, crucible, ladle and gas producer linings. In enumerating some of the uses of Pecora Heatpruf, the company points out the economy of protecting linings before they begin to crack and crumble, rather than waiting until the linings are so badly damaged that they have to be replaced.

Where pit fires are used, an additional saving is made by keeping the linings in good repair instead of letting the fire brick crumble away until the coal space is so enlarged that considerably more coal is used than is necessary.

OAKLEY CHEMICAL COMPANY

The February issue of the Oakite News Service, published by the Oakley Chemical Company, 22 Thames street, New York, contains an interesting account of a conference held at the closing of the year 1917 by the Oakley company. The assembled officers and representatives of the company were addressed in turn by President George W. Oakley, Vice-president Daniel C. Smith and General Manager David C. Ball.

President Oakley said, in part, as follows: "To you who from day to day are doing your part so well in the great industrial and manufacturing plants of the country, this company extends a welcome and its sincere appreciation of what you have accomplished. It counts itself indeed fortunate in having such a body of men who have given so fully of their time and thought to the solving of cleaning problems. Upon you rests a responsibility that I know you welcome, and in giving manufacturers the best that is in you to the end that production reaches its highest point, you render the greatest service to your country in these momentous times."

The address of Vice-president Smith was devoted to the progress which the company had made in developing their business, the manufacture of cleaners for metal finishing.

The last speaker at the conference was General Manager D. C. Ball, who said: "This conference was carefully planned with a view of bringing you together at this critical time, not only to discuss cleaning in all its phases, but to find how we may best serve the manufacturing concerns throughout the country, and in so doing serve the nation.

"We have laid out a schedule like a railroad time-table, and we are going to stick to that schedule. Every minute will count, for we are here to give facts, to reach conclusions as to the one best way of solving a certain cleaning problem. If you have a method which you have found 99 per cent. efficient for doing a particular class of work, let us hear about it, so that all may adopt it. In this way our fund of knowledge will increase.

"The call upon us for the services of men thoroughly trained in our methods of cleaning are becoming more numerous and urgent. We must, therefore, each of us, use our time to the best advantage in order to measure up to this demand."

Among the papers read at the conference were the following:

"Oakite and Its Compounds in Automobile Factories," Mr. Aston.

"Oakite Platers' Cleaner in Other Than Plating Works," Mr. Graue.

"Oakite Platers' Cleaner vs Caustic Soda in Railroad Shops," Mr. Whipple.

"Oakite, etc., in Stove Works and Removing Vitreous Enamels," Mr. Lowe.

"The Platers' Point of View," Mr. Reama.

"Electric Cleaning," Mr. Bernard.

THE OAKLEY CHEMICAL COMPANY IN GENERAL CONVENTION.

"The Uses of Oakite by the U. S. Government," Mr. Hoffschmidt.

"Oakite in Textile Mills," Mr. Magnuson.

"What Is Meant by 'A New Principle in Cleaning,'" Percy A. Boeck, chemical engineer.

TESTIMONIAL TO GENERAL MANAGER D. C. BALL.

The bronze figure of a Japanese tiger, shown in our second illustration, represents the testimonial the men of the company gave to Manager Ball as a token of their esteem and appreciation of his efforts in building up the organization of the Oakley Chemical Company.

THE SMALLEST BENCH LATHE TOOL-HOLDER MADE

The cut shows the smallest bench lathe tool-holder on the market. It is manufactured by the Ready Tool Company, Bridgeport, Conn., and is known as their New Style O O Toolholder.

In getting out this tool-holder the manufacturers have considered particularly the requirements of users of bench and

SMALLEST BENCH LATHE TOOL.

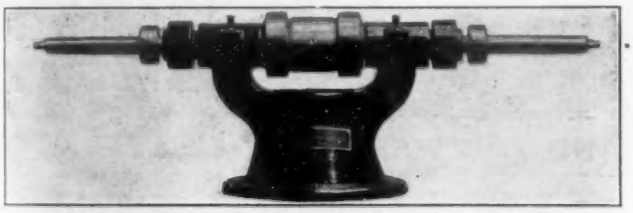
watch lathes, and for the first time the correct size of holder required in these lathes can be secured.

The tool-holder is a fine quality of drop forging, broached with a perfectly square and true hole for the cutter. The cutter furnished is finest grade of high speed treated by Taylor-White process. These tools are nicely finished and sent complete, with a 3/16-inch square cutter and wrench. The size of the holder is 5/16 inch x ½ inch x 3½ inches.

INDEPENDENT POLISHING LATHE

The lathe shown in the cuts has been brought upon the market by the Chase Turbine Manufacturing Company, of Orange, Mass. The principal feature claimed for this machine is that either end of the lathe can be stopped for replacing wheels or cuffs independent of the other.

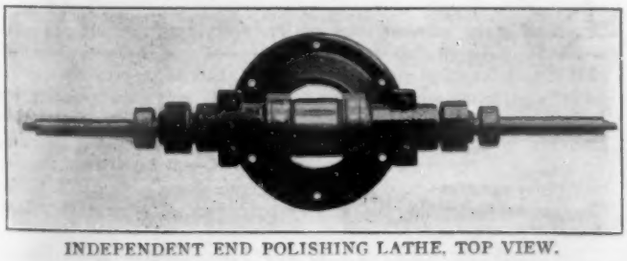
The spindles operate through a set of self-aligning ball bearings, which are attached to either end of a sleeve which is held firmly in place by the bearing caps.



INDEPENDENT END POLISHING LATHE, SIDE VIEW.

The clutch is of the expanding type operating on the inside of the drive pulley by means of a sliding rod running through the spindle itself. The clutch is thrown by means of a loose collar which operates over a taper pin.

To throw the clutch the operator grasps this collar and slides it towards the center of the machine, while to start the spindle the operation is reversed.



INDEPENDENT END POLISHING LATHE, TOP VIEW.

The drive pulley, which also acts as the outside clutch case runs on a set of independent ball bearings, thus removing all driving strain from the spindle and the clutch itself.

The clutch operates in oil, while all of the bearings are packed in grease and protected by grooved grease rings, the spindle itself being oiled through the oil caps on the boxes.

The machines can be driven from any desired direction. That is from above, from the side or from below through the base.

The machine is built in one style, but in four sizes, namely: The small bench machine illustrated in the photograph sent, a heavier bench machine, a light floor stand machine and a heavy duty floor stand machine, the latter two machines being built on pedestal bases.

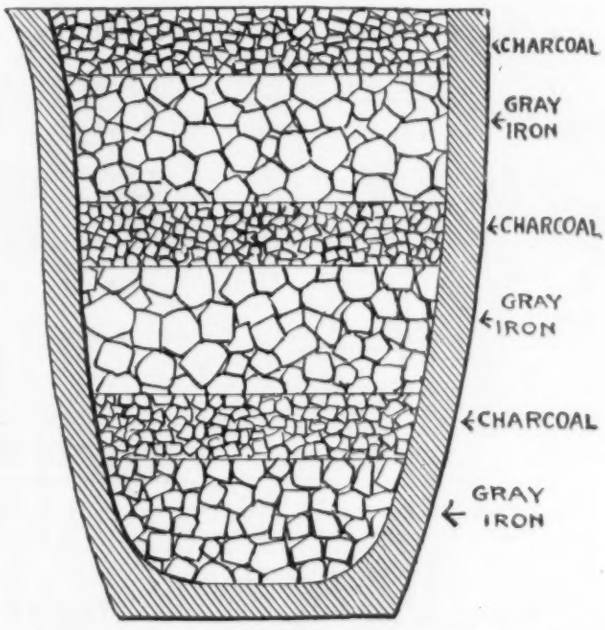
IRON CASTINGS IN THE BRASS FOUNDRY

The following article has been issued by the Joseph Dixon Crucible Company and should prove interesting in connection with the article on the same subject by W. H. Parry in THE METAL INDUSTRY for January, 1918.

How often it happens that you must have an iron casting in a hurry, and such a hurry, that you cannot wait to take the pattern to the man who makes your iron castings and wait till the use for the casting is almost over.

Every one who operates a brass foundry but who has no iron foundry, can make iron castings quickly and cheaply in his crucible furnace, for he has all the equipment necessary for making these hurry-up, important little iron casting jobs. You could have your casting almost before your pattern reached the iron foundry.

Gray iron of the better kind melts at 2327 degrees Fahrenheit,



HOW TO PACK A CRUCIBLE FOR MELTING CASTING IRON.

and while this may look to your brass founder to be a high heat compared with the yellow brass or composition metal he regularly melts, the casting of gray iron in his graphite crucible is not given a second thought. The melting of gray iron in a graphite crucible is so simple that it is surprising that the practice is not more general.

Alternate layers of charcoal and gray iron, broken to pieces about the size of walnuts or larger (if it is not convenient to have pieces so small), are put in a Dixon Graphite Crucible, and the melting is done in your pit brass furnace, and an iron casting of high grade will be secured in a very little longer time than it takes to make a brass casting.

Use the bottom of an old brass crucible as a cover—this keeps the sulphur fumes and coal out of the crucible and also helps to make the melt more quickly.

Use a little Dixon's No. 2441 Silica Lead on your sand as a facing, and ten to one you will have as good, if not a better casting that ever came into your shop. It is surprising how easily this can be done.

Reprinted from February, 1918, issue of "Graphite."

METAL MEN IN THE SERVICE OF THE ALLIES—SERIES III

CAPTAIN WALLACE H. LINN.

THE HONOR PAGE

The Metal Industry invites anyone connected with the metal trades who is in the service to send in photograph and story of career.

SERGEANT FRANK C. RUSHTON.

CAPTAIN WALLACE H. LINN, U.S.R.

Captain Linn was up to the time of his entering the army assistant treasurer and works manager of E. A. Williams & Son, Inc., brass and bronze foundries, 105-111 Plymouth street, Jersey City.

Captain Linn has since last fall been engaged in the organizing and equipping of a foundry and forge unit for foreign service in connection with the American Ordnance Base Depot in France. At the time of leaving this country, Captain Linn was in charge of this unit, which was made up of a complete brass and iron foundry department, and a forge shop and heat treating department.

Detailed information as to the size and layout of these organizations are not permitted. We think it could be stated, however, that they are very large and are made up of careful selected skilled mechanics, who are all enlisted men, and that the equipment of same is of up-to-date character. The full equipment from the largest machine to the simplest molders tool have been produced and shipped from this country.

Captain Linn has been connected with E. A. Williams & Son, Inc., for years, and is well known among foundrymen, as having specialized in recent years on modern foundry methods.

SERGEANT FRANK C. RUSHTON

Sergeant Rushton was for 10 years foreman electro-plater at the Charter Oak Stove & Range Company, St. Louis, Mo., and an active member of the St. Louis branch of the American Electro-platers' Society, of which he was secretary for two years. Sergeant Rushton is attached to Co. B 138th Regular Infantry at present at Fort Sill, Oklahoma.

METAL SHOPS AND THE WAR

As an illustration of what the metal firms are doing to keep Uncle Sam in the prosecution of the war we are glad to publish the following:

H. MUELLER MANUFACTURING COMPANY

The H. Mueller Manufacturing Company, of Decatur, Ill., manufacturers of brass goods, has one member of the firm, Lucien W. Mueller, a lieutenant of the Ordnance Department. They have twenty-one other men in various branches of the service.

The company's and employes' subscriptions to the Liberty Loans and other war causes are as follows:

Liberty Loan—		
1st Issue—Company	33,050	
2d Issue—Company	100,000	
		133,050
1st Issue—Members	30,250	
2d Issue—Members	42,200	
		72,450
Red Cross		2,000
Y. M. C. A.		1,050
Employes—Liberty Loan—		
1st Issue	11,700	
2d Issue	19,850	
		31,550

ROME MANUFACTURING COMPANY

The Rome Manufacturing Company, makers of copper and brass products at Rome, N. Y., have at present 73 employees in the service.

Subscription of the company to the First Liberty Loan was $250,000 and to the Second Liberty Loan $200,000. To the Red Cross $4,075.

Regarding the Y. M. C. A.—just prior to their War Campaign there was established in Rome, the Rome War Chest Association, enlisting the people of this community in this association for the duration of the war, at subscriptions varying from $12 per year upwards. During this campaign the people of Rome subscribed $345,298.40 for each year the war lasts, this money to be applied to all war relief purposes; all solicitations and subscriptions for these purposes to cease hereafter. The company's subscription amounts to $2,200 per month, or $26,400 per year, and, together with other funds in the Rome War Chest, will be distributed for war relief purposes through the American Red Cross, Y. M. C. A., Knights of Columbus, Salvation Army, and all other institutions devoted to war relief work.

The employes subscribed to the First Liberty Loan Bonds $33,150 and to the second issue of Liberty Loan Bonds $69,700; to the Red Cross drive for membership last May, 821 memberships, and to the Rome War Chest they subscribed for the duration of the war to the extent of 100 per cent. of employes employed in one plant and 99.7 per cent. of employes employed in the other plant.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN ELECTRO PLATERS' SOCIETY

NEW YORK BRANCH ENJOYS ITS NINTH ANNUAL BANQUET

In accordance with President Wilson's approval of the continuation of the practice of holding conventions and banquets, the New York branch of the American Electro Platers' Society held its ninth annual banquet and reunion at the Broadway Central Hotel, New York, on Saturday, February 23, 1918.

All day was devoted to the occasion, and here in the parlors of the hotel were gathered platers, representatives of platers-supply firms and their friends to renew old acquaintance, make new ones, swap platers' yarns, discuss problems and view the exhibits of firms and platers and then acquire an appetite for the menu described in plating terms, which was served to them at 8:30 p. m.

The exhibit of work done by platers was as follows: Royal F. Clark, Acme Shear Company, Bridgeport, Conn., samples of various finishes on metals.

Thomas Haddow, August Goertz & Company, Newark, N. J., a display of bag frames in various finishes, together with samples of colored metal finishes.

L. J. Jenner, American Phonograph Company, New York, samples of finishes used on phonograph parts.

E. Maraffi, Harvey Hubbell, Bridgeport, Conn., a collection of electric light sockets in a large variety of finishes.

A. A. Brummel Company, Inc., Worcester, Mass., exhibit of hot galvanizing or zinc plating on bed springs and the like.

American Chain Company, Bridgeport, Conn., samples of metal chain finished in copper, brass, zinc, nickel and bronzes.

Among the plating supply houses that had exhibits of their wares and distributed literature were the following:

The Oakley Chemical Company, 22 Thames street, New York, had an extensive exhibit of various classes of metal cleaners, together with pamphlets describing the same.

The U. S. Electro Galvanizing Company, Brooklyn, N. Y., exhibited a model of a continuous plating machine for all metals, and also an automatic self-emptying plating barrel, with washing and drying attachment.

The Norton Company, Worcester, Mass., had on view samples of the abrasives adapted for the finishing of metals, Alundum and Crystolon, and also pieces of Bauxite, the crude material from which these compounds were made.

The Celluloid Zapon Company, New York, showed samples of finishes obtained with their lacquers on wood and metal objects.

The J. B. Ford Company, Wyandotte, Mich., exhibited samples of their Wyandotte cleaner and distributed literature relating to its uses.

The banquet, which followed the afternoon of visiting and inspection, took place in the dining room on the main floor and started at 8:30 p. m. The menu, which engaged the attention of the platers and their friends, was as follows:

MEAN YOU.

Indigo Points 50-50 (half on and half off)
Tarnished Olive Salary
Cream of Chicken with H_2O (very weak)
Young and Tender Croquets with Guardians
Cyanide Bath
Ex-Capon a la Scratch Brush, Stuffed with White Lead
Spuds with Saccharine
Milk Below Zero
Tripoli Cakes with Silver Plated Frosting
Black Nickel (very little)
Choice of Stogies and Corn Cobs

During the consumption of the articles contained in the above menu a musical program was rendered. A number of patriotic songs were sung, the words of which were included on the menu card so that the diners could easily follow the music.

As will be seen by referring to the photograph, one of the most important features of a gathering of this kind, it was not a complete success, but we have published it in order to furnish indisputable evidence for the benefit of anyone who might unfortunately have to establish an alibi as to his whereabouts on that particular evening.

The president of the New York branch, Thomas B. Haddow, presided as toastmaster in the absence of Dr. William App Jones, of the Celluloid Zapon Company, New York, who was prevented from attending by illness. Mr. Haddow acquitted himself most creditably and introduced M. A. Williamson, of the Norton Company, Worcester, Mass., as the first speaker. Mr. Williamson, whose address is reproduced in this issue of THE METAL INDUSTRY, entertained the platers with an interesting screen talk on the subject of Alundum, Its Manufacture and Use.

Dr. Blum, of the United States Bureau of Standards, followed Mr. Williamson, and gave a résumé of the work the Bureau of Standards at Washington, D. C., has been doing in reference to electro-plating in general, with particular emphasis as to the treatment of parts of aeroplanes in order to render them resistant to the corrosive effects of the atmosphere. At the conclusion of Dr. Blum's speech he earnestly urged the co-operation of the Electro Platers' Society with the Bureau of Standards for the furtherance of the establishment of methods for weather proofing metallic materials.

At the suggestion of George B. Hogaboom, a resolution was passed in the form of a rising vote that the members of the New York branch at least pledge themselves to do all in their power to aid the Government in its work of winning the war.

Following Dr. Blum, Charles Pack, chemist and metallurgist of the Doehler Die Casting Company, Brooklyn, N. Y., presented an address on War Time Production Methods. This, Mr. Pack stated, had direct reference to the subject of die casting, and he then proceeded to give his audience some valuable information in relation to the preparation of die castings. Mr. Pack's address in full is published in this issue of THE METAL INDUSTRY.

A letter was read at the conclusion of the banquet from Dr. J. W. Richards, an honorary member of the society, at present serving on the Naval Consulting Board at Washington, D. C., which said that he regretted very much his inability to be present.

The souvenirs distributed at the banquet were as follows: The menu cards were furnished by the Oakley Chemical Company, of New York, who also presented a small hundred-page book devoted to the cleaning and electro-plating of metals and which was very gratefully received by the recipients. Paper hats in the shape of Indian wigwams, having emblazoned thereon the word Wyandotte, together with metal paper cutters, were distributed by the J. B. Ford Company, of Wyandotte, Mich. Pencilholders in the form of rifle bullets by the Celluloid Zapon Company, New York. Cigars from the Egyptian Lacquer Company, New York. Badges, worn by the members and their guests, were furnished by Maas & Waldstein Company, Newark, N. J.

The banquet committee consisted of William Schneider, chairman; Thomas P. Haddow, William Fischer, J. A. Stremel, William Voss, John Sterling and Joseph Minges.

The reception committee was as follows: Benjamin Popper, H. C. Barnard, O. C. Moller, H. Maynard, C. de Baun, C. G. Backus, M. E. Stewart, Thomas Trumbour, C. H. Buchanan, H. Reama, Thomas Brown, C. Frey, W. S. Elwin, L. M. Graham, A. P. Munning and L. J. Krom.

The officers of the society are: Thomas P. Haddow, president; John E. Sterling, vice-president; William Fischer, secretary and treasurer; William Betz, recording secretary; R. E. Massicotte, sergeant-at-arms; William R. Shanks, assistant sergeant-at-arms; Joseph Minges, librarian; William Voss, laboratory chairman.

New York Branch—Meets second and fourth Fridays of each month at 32 Union Square, New York City. Thomas B. Haddow, 64 Arsdale Terrace, East Orange, N. J., president and William Fischer, 300 St. Anns Avenue, New York City, secretary.

The two meetings for the month of February were well attended and the main topic of discussion was the various dips used on different metals, together with the various dips used in oxidizing metals.

THE NINTH ANNUAL BANQUET OF THE NEW YORK BRANCH OF THE AMERICAN ELECTRO-PLATERS' SOCIETY HELD AT THE BROADWAY CENTRAL HOTEL, NEW YORK, FEBRUARY 23, 1918. WHILE THE PICTURE IS POOR OWING TO A SHORT CIRCUIT (THROUGH NO FAULT OF THE LIVE WIRE PLATERS), IT MAY SERVE AS AN AID IN ESTABLISHING AN ALIBI.

Cleveland Branch—Meets second and last Friday of the month at 1344 East Prospect street. W. D. Scott, 3475 West 90th street, Cleveland, Ohio, secretary.

The meetings of this branch, which have been heretofore held the second and last Saturdays of the month, will now be held the second and last Fridays, which, the secretary states, he believes will be more satisfactory for the members of the Cleveland Branch.

Rochester Branch—Meets the second and fourth Fridays of each month at the University of Rochester. George Hesselink, president, and Sylvester Gartland, 128 Bryan street, Rochester, N. Y., secretary.

Frank Kolb, chemical instructor, is very anxious to have a larger number of the foremen electro-platers take advantage of the excellent opportunity to learn chemistry. The Branch has adopted as a text book "Foundations of Chemistry," by Blanchard & Wade, and the members are said to be making very good progress.

It was decided at the last regular meeting to hold the fifth annual banquet at the Osborn House, on March 30, and President George Hesselink appointed the following Banquet Committee:—Sylvester P. Gartland, C. V. Hering, Charles Griffen and Adolph Wahl. The committee extends an invitation to all managers, super-

intendents, chemists and foreman platers to participate. The tickets for the occasion will be $1.50 and they may be obtained from any of the members of the Rochester Branch or from the secretary.

Philadelphia Branch—Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce streets. Philip Uhl, 2432 North 29th street, Philadelphia, Pa., secretary.

The regular monthly meeting was held on March 1, at which time a discussion was had on the method of dissolving copper out of silver tubing after being manufactured into bracelets. J. D. McEvery also exhibited some samples of finishes on hardware. One application for active membership was received.

Chicago Branch. Meets fourth Saturday of each month, 8 p. m., Western Building, Randolph Street and Michigan Ave. Secretary C. E. Thornton, 948 Le Claire Avenue, Chicago, Ill.

This branch held a very successful banquet on Saturday evening, February 16, 1918.

The president of the branch, H. A. Gilbertson, presided as toastmaster and addressed the gathering on the state of the branch. He was followed by Col. J. H. Hansjosten, past supreme president and first president of the branch. Col. Hansjosten's address was largely suggestions for an educational program for the Chicago branch. He was followed by Oscar E. Servis, supreme secretary, who read an able paper on "Efficiency on Electro-Deposition," which will be printed in *The Review*. George Burt read a paper entitled "The Bright Dip." R. J. Hazucha read an interesting paper on "The Hot Copper Bath," and John Lackerbie presented "Plating of Cast Iron in Cyanide Solutions."

AMERICAN INSTITUTE OF METALS

Milwaukee, one of the leading foundry centers of the United States, has been selected as the 1918 meeting place for the annual conventions of the American Foundrymen's Association and the American Institute of Metals. Concurrent with these gatherings will be held the exhibition of foundry equipment and supplies, machine tools and accessories. On Monday, October 7, the deliberations of the two foundrymen's technical societies will be opened with a joint session, and at the same time the visitors will be given their first opportunity to inspect the displays. The convention and the exhibition will continue throughout the week.

Two meetings of the two associations and the exhibition will be held in the auditorium, where ample display space will be afforded and a sufficient number of large meeting rooms are available for the joint sessions, which will be scheduled for three days of the week. This commodious building will be the center of all the foundrymen's activities, and here the headquarters will be established for both organizations.

The auditorium is one of the largest and most complete structures of its kind in the world. Machinery Hall, where the operating exhibits will be assembled has a floor area of 54,000 square feet, and the Arena, where the still exhibits will be located, has a floor area of 22,500 square feet. If necessary, the stage, 50 x 68 feet, also may be used for exhibition purposes. Two large meeting halls are located on the first and second floors, respectively, and are separated by wide corridors from the exhibition areas, thereby insuring freedom from noise. Milwaukee also has ample hotel facilities to provide accommodations for the 3,000 to 3,500 visitors who attend these affairs.

Milwaukee is one of the largest foundry centers of the United States, and provision will be made for plant visitation throughout the week. Within the confines of the municipal limits of the city are located about 80 gray iron, steel, malleable iron and brass foundries, and including North and South Milwaukee and West Allis the total is in excess of 90. Racine, Wis., only a short distance from Milwaukee is the center of approximately 20 foundries. Milwaukee also is one of the leading steel casting districts of the world. It has approximately 20 steel foundries, a number of which recently have installed small open-hearth and electric furnaces. According to the 1914 statistics the value of iron, steel and heavy machining of Milwaukee exceeded that of any other of its industries, with a total of $34,300,585, and it is estimated that last year this totalled more than $50,000,000.

The committee of the American Foundrymen's Association empowered to decide upon the time and place of the 1918 convention and exhibition, which met in Milwaukee in February, consisted of the following: Benj. D. Fuller, president, Westinghouse Electric and Manufacturing Company, Cleveland; C. E. Hoyt, exhibition manager, Chicago; H. R. Atwater, Cleveland Osborn Manufacturing Company, Cleveland; S. T. Johnston, S. Obermayer Co., Chicago; V. E. Minich, Sand Mixing Machine Company, New York, and A. O. Backert, secretary-treasurer, Cleveland.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

Hugh McPhee has become connected as foundry superintendent with A. Allan & Son, manufacturers of Allan antifriction metal, Harrison, N. J.

R. R. Clarke, formerly superintendent of the metal foundry of the Pennsylvania Railroad Company, Pittsburgh, Pa., is now superintendent of the Eagle Brass Foundry, Seattle, Wash.

H. O. Winslow, for the past thirty-six years foreman of the brass foundry of the E. Miller Company, Meriden, Conn., has accepted a position to take charge of the brass foundry work of the Excelsior Brass Works, of Reading, Pa.

Russell T. Gray, formerly advertising manager of the Haynes Automobile Company, and more recently secretary of the Shuman Advertising Company, Chicago, Ill., has established an office in the First National Bank Building, Chicago, as an advertising engineer. Advertising service will be rendered a limited number of clients in the technical field which will involve a broad knowledge of the engineering sales problems as well as of advertising. Technical advertising in trade papers and magazines, as well as all forms of engineering catalogs and direct-by-mail advertising will be handled.

W. D. Berry has severed his connection with the Keystone Bronze Company of Pittsburgh and New Brighton, Pa. Mr. Berry has been with the Keystone Bronze Company as general supt. for over six years, making his headquarters at New Brighton, Pa. Mr. Berry states that after a brief rest he will look for a suitable site in the Beaver Valley and start into the manufacture of brass, bronze, and copper castings. Mr. Berry is well known in the Pittsburgh district and is considered an expert foundryman, making a specialty of blast furnace and rolling mill castings, also railroad journal bearings.

DEATHS

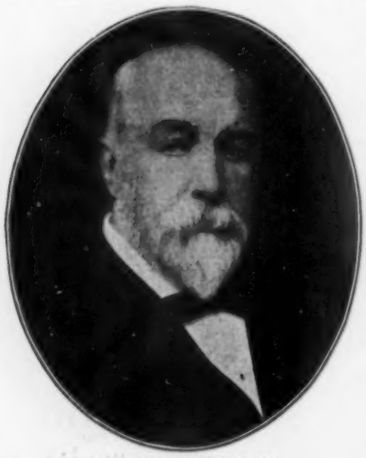
James Brannen, former president of The Horn and Brannen Manufacturing Company, makers of chandeliers, and a member of the Metal Manufacturers' Association, died at his home Wynmore, Chestnut Hill, Philadelphia, Pa., February 24. He was seventy-four years old. Death was due to acute indigestion from which he had been a sufferer for some time.

Mr. Brannen was born in Montgomery County, January 24, 1844. He enlisted as a naval engineer in the Civil War when eighteen years old and served throughout the conflict. He served his apprenticeship as a machinist in the old firm of Wiskie, Merrill and Thackeray, makers of chandeliers. He was also president of the Cunningham Piano Company.

A widow, three sons and one daughter survive him.

F. W. MATTHIESSEN

F. W. Matthiessen, one of the pioneers in the zinc industry in this country, passed away at his home in La Salle, Ill., on February 11. He was born in Germany in 1835 and was a graduate of the Freiberg School of Mines, where he formed his friendship with Edward C. Hegeler, both coming to this country together in 1856.



F. W. MATTHIESSEN.

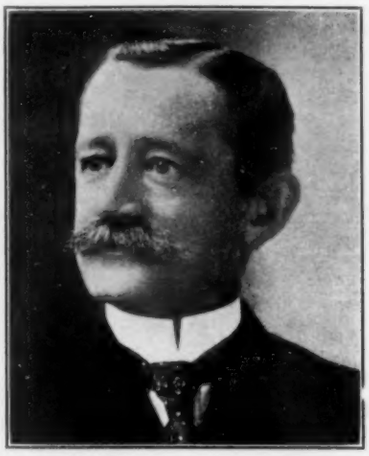
Their first enterprise in this country was an attempt to produce zinc from a silicate ore near Bethlehem, Pa. They were successful technically, but the company which had previously been working on it lacked funds to go on. They then went West to Missouri and made some successful experiments in smelting zinc ore, but political conditions interfered with commercial development, hence they went to Wisconsin and from there back to La Salle, Ill., where zinc smelting was definitely established by them. In 1871 the firm of Matthiessen & Hegeler was incorporated, and in 1881 a sulphuric acid plant was added. The firm became famous for its advanced metallurgical practice.

Mr. Matthiessen was for ten years mayor of La Salle and was a member of the American Institute of Mining Engineers.

Mr. Matthiessen also developed the Western Clock Manufacturing Company, of La. Salle, Illinois, which manufactures the Big Ben alarm clock, from a small plant having 25 men to the present large institution which employs some 2,000 workers.

GEORGE J. ALTHEN

George J. Althen, treasurer the Driver-Harris Company, Harrison, N. J., died February 15. Mr. Althen was born in Newark, N. J., August 6, 1857, and was for many years engaged in the grocery business. For the past four years he had been connected with the Driver-Harris Company and was well known through his affiliation with the National Credit Men's Association, being New Jersey's representative on the executive committee.



GEORGE J. ALTHEN.

Arthur Irving Jacobs, inventor and manufacturer of the Jacobs Improved Drill Chuck, died in Hartford, Conn., February 16, after being stricken by a paralytic shock on the day previous while driving his automobile to his factory. He was born in Hebron, Conn., August 13, 1858, and after a few years of schooling went to work for the Knowles Loom Works at Worcester, Mass., for $1.25 a day.

In 1902 Mr. Jacobs invented what is known as the "Jacobs Improved Drill Chuck," the patent on which was allowed September 16, 1902. The Jacobs Manufacturing Company was incorporated in 1903, and since that time the factory has expanded until it now employs nearly 150 hands, and is one of the most important of the smaller factories in this section of the state. Mr. Jacobs leaves a wife and three children.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW BRITAIN, CONN.

MARCH 11, 1918.

The unusual activity, due to the war and Government contracts, which has been going on among the local factories for the past several months, shows no sign of abating and from reports at these concerns it seems certain that the present year will be a busy one. In several factories it has become imperative that production be speeded to its maximum on account of Government work, and to this end the Government is having a large addition erected for the New Britain Machine Company, which is already operating a day and night shift. The addition will be of brick, steel and concrete construction, one story high and measuring some 370 feet in length by about 70 feet in width. Already a large corps of ordnance department men are here to supervise its construction, and the premises have been fenced off so that admittance is only by ticket and all alien enemies have been warned to keep out of the neighborhood.

The North & Judd Manufacturing Company continues to keep up with its previous war-time record of turning out vast quantities of saddlery hardware. Fifty odd years ago, during the Civil War, this concern, then in its infancy, was put financially on its feet by large Government orders for army buckles, and the same great rush of war trade is swamping the production department to-day. The Traut & Hine Manufacturing Company, engaged in a similar line of work, as well as the G. K. Prentice Manufacturing Company, another concern in a kindred business, are all handling as large orders as they are capable of filling. Even before the Monday closing order was revoked in this State, the Government had exempted the Traut & Hine Manufacturing Company as well as certain departments of the Corbin Screw Corporation and other departments of the P. & F. Corbin division of the American Hardware Corporation, where important government work was being done. The Union Manufacturing Company, whose new office and factor building was completed several months ago, has moved into its new office, and the same is true at the Machine Company, where a new office department has been installed. The Stanley Works, too, is very busy, not only in its regular line of metal butts and hinges but also on government orders. These orders are for various small parts. At this concern gas masks for the allied forces are also made.

Landers, Frary & Clark is maintaining a record-breaking pace in its manufacturing department and is not alone supplying its private trade, which extends to all quarters of the globe, but is also doing some government work. A two-story factory addition with a railroad frontage is nearing completion and, it is said, army canteens are to be turned out here in vast quantities. While the demand for labor in some instances exceeds the supply, there has not as yet been any serious shortage of labor here. Reports in various quarters show that the railroad congestion which has been acute for the past few months is improving and the factories are being enabled to receive and distribute their shipments a little better than heretofore.

Although the various concerns are holding their annual meetings at this time, the only one of importance this month thus far has been at the Hart & Hutchinson Manufacturing Company, where Howard S. Hart has retired as president to take a position as chairman of the board of directors. This is a new system at this concern, for in the past the president has acted as chairman of the directorate. As a result of the creation of this office several other changes in the personnel have been made. Maxwell S. Hart becomes president and Loren E. Page takes his old position as vice-president, while Donald R. Hart has been promoted from assistant treasurer to treasurer, succeeding Norman P. Cooley, who remains a director. H. R. J.

TORRINGTON, CONN.

MARCH 11, 1918.

The annual meeting of the stockholders of the Turner & Seymour Company was held at noon on February 13. The following directors were elected: Charles F. Brooker, Ansonia; Thomas W. Bryant, Torrington; E. L. Frisbie, John P. Elton and Edward H. Green, of Waterbury, and Frank M. Travis, of Torrington. The directors elected the following officers: President, Charles F. Brooker, of Ansonia; vice-president, John A. Coe, Jr., of Waterbury; treasurer, Francis H. Griffith; secretary, Henry S. Washburn. Following the meeting the resignation of Edward P. Quinn, superintendent of the foundry was read. Mr. Quinn has rounded out nine years with the Turner & Seymour Company. He came to the factory as assistant superintendent to J. M. Perkins, who is now with the Gilbert & Barker Manufacturing Company, Springfield, Mass., as works manager. For a year Mr. Quinn was purchasing agent, when he was elevated to the management of the foundry. The sales of the plant have averaged about $1,500,000 per annum. Mr. Quinn has had charge of the brass and iron foundry sales, as well as acting as superintendent. There have been numerous changes at the Turner & Seymour plant within the past month or six weeks. The resignation of Louis G. Kibbe as president has been followed by the retirement of H. H. Leonard as works manager, Harry B. Houghton as sales manager, and more recently Mr. Quinn.

Employes of the mechanical department at the Coe Branch American Brass Company presented William Hubbard, a former employe, with $20 in gold on February 9, while the young man was spending a furlough here with his parents. Mr. Hubbard is now connected with the Aero Squad, at Morrison, Va.

Wadsworth Doster, treasurer of the Torrington Manufacturing Company, has been designated manager in Torrington for the next Liberty Loan drive. No amount has yet been stipulated as Torrington's share of the work.

If his business affairs can be satisfactorily adjusted, Harry Burgess, purchasing agent at the Union Hardware Company, will go abroad with the Y. M. C. A. forces for work in France. The Union Hardware Company has a large contract for metal tackles placed by the Emergency Shipbuilding Board. The work will run into the late spring.—L. M. R.

PROVIDENCE, R. I.

MARCH 11, 1918.

The coal situation and the "heatless" Monday closing at the direction of the Fuel Administrator, in accordance with the national movement to conserve fuel, hit the Rhode Island metal working industries in all lines hard. Plants working on Government contracts were given preference through obtaining special permission from the administration to receive coal supplies and to continue operations.

But when the industrial history of Rhode Island for 1918 shall be written, the month of February will occupy a peculiar and unprecedented position as having been a month of only sixteen working days. And this, notwithstanding the fact that in practically all instances there was sufficient work to keep the plants on a full time schedule during the entire month. A short month at the best with only 28 calendar days, there was a total of twelve closed days—four Sundays, four "heatless" Mondays, two holidays (Lincoln's and Washington's birthdays), and Saturday afternoons. In consequence the month was an especially trying one for employers and employes alike.

All branches of the metal industry continue to maintain their top speed record that has been experienced by nearly every concern for upwards of three years now. New orders are received regularly, in fact, in many instances faster than those already on the books can be filled, and the indications for the future appear promising for many months to come. As to the lines identified with and incidental to the manufacturing jewelry industry conditions are somewhat chaotic through the fact that the product being largely non-essential many concerns are seeking and taking on contracts or sub-contracts on Government work in metal parts, while few, if any, of the manufacturers seem to know even though they might be willing to do so, what to make in jewelry lines that will be in demand.

The annual meeting of the stockholders of the American Screw Company was held early in the month, at which the president, Samuel M. Nicholson, presented the 58th annual report of the directors. After reviewing the business history of the company during the very successful year just passed, and commenting especially upon the increasing difficulties and expenses of doing business under the present complex conditions, the report noted the declaration and payment during the year of dividends amounting to 22 per cent on the outstanding capital stock, this making an average dividend return of 10 per cent for the 12 years beginning with 1906. Mention was made of the death of Walter W. Griffith.

The following were chosen to the Board of Directors: Samuel M. Nicholson, Charles Alexander, George L. Shepley, John R. Gladding, George W. Thurston, Marsden J. Perry, Benjamin Thurston, William G. Smythe and Paul C. Nicholson. At the subsequent meeting of the directors, officers of the corporation were elected as follows: President, Samuel M. Nicholson; general superintendent, Benjamin Thurston; assistant general superintendent, Benjamin R. Thurston; treasurer, George W. Thurston; sales agent, William G. Smythe; assistant sales agent, Albert B. Peck; secretary, Albert M. Dunham; assistant secretary, George F. Staples.

The annual meeting of the stockholders of the Nicholson File Company was held a few days ago, at which Samuel M. Nicholson, the president, said it was gratifying to be able to report that in spite of the greatly increased cost of doing business, and of all material, supplies and labor, the company had completed the best year in its history. The following directors were elected for the ensuing year: Samuel M. Nicholson, Marsden J. Perry, John R. Gladding, Paul C. Nicholson, Byron S. Watson, Harold C. Field and Ernest S. Craig.

At a subsequent meeting of the Board of Directors the following officers were chosen: President and general manager, M. Nicholson; vice-president and treasurer, Paul C. Nicholson; assistant treasurer and cashier, Henry W. Harman; assistant treasurer, Albert J. Dana; domestic sales manager, Wallace L. Pond; foreign sales manager, Harold C. Field; secretary and assistant general manager, Ernest S. Craig; assistant secretary and manager of credits, Augustus E. Saunders; assistant to president, Robert W. Hathaway.

Charles Mendell has filed information with the City Clerk's office that he is the sole owner of the Star Sheet Metal Works, 49 Bogman street, Providence.

The E. M. Dart Manufacturing Company, which recently purchased from the receivers of the Metal Products Corporation, the property on Thurbers avenue, Eddy and Blundell streets, Providence, has leased floor space aggregating 30,170 square feet to the Screw Machine Products Corporation for five years from January 18, 1918.

The business conducted under the name of The Jenkinson Brass Foundry Company, 139 Clay street, Pawtucket, is owned by William S. White, Robert Tyson and Herbert Johnson, according to their statement filed at the office of the Pawtucket City Clerk.

Harry Sahogian, doing business as the American Electroplating Company, at 25 Calender street, this city, has made a general assignment for the benefit of his creditors to Jasper Rustigian. No statement has been made as to the amount of the assets or liabilities.

Articles of incorporation for the A. & Z. Chain Company, with an authorized capital of $50,000, have been filed at the office of the Secretary of State, under the laws of Rhode Island. The incorporators are Charles Anshen, Salkind Zetlin and George W. Bugbee. The concern is engaged in manufacturing, buying and selling jewelry, at 116 Chestnut street, this city.

The Gorham Manufacturing Company, which has munition contracts from the United States Government to the amount of $8,500,000, and more than an additional $1,000,000 in sub-contracts, has recently issued a $3,500,000 mortgage bond at 7 per cent to meet the necessary outlay in material and equipment for the extensions.—W. H. M.

BOSTON, MASS.

MARCH 11, 1918.

There is joy among the metal industries over the decision of the Massachusetts fuel administration rescinding on March 4 the Garfield order. The result is that all plants have returned to the normal schedule. Fuel Administrator Storrow makes it plain that there is not an abundance of fuel, however, and appeals to the manufacturers to take voluntary measures to economize in coal.

The strike of the Molders' Union, which had tied up work in nearly 100 foundries for the last two weeks, has been settled, the members having ratified an agreement reached with the New England Foundrymen's Association at the Boston City Club. By the terms of the settlement the men will receive an increase of 50 cents a day immediately, with a further increase of 25 cents April 1. The men, who were receiving $4.50 a day, struck when their demands for an increase of $1 was refused. More than 1,400 men have returned to work as a result of the settlement.

The Boston branch of the National Metal Trades Association and the Employers' Association dined at Young's Hotel last week. Frank Burgess, president of the Boston branch, presided at the business meeting which preceded the dinner. The speakers were Walter Drew, counsel for the National Erectors' Association, and Edward F. McSweeney, of the War Efficiency Board.

A large annex to the Mead-Morrison munitions plant is soon to be constructed in Gloucester, which will double the capacity for output and the number of hands employed. The new building will measure 84 feet by 240 feet and occupy the large vacant tract of land, south of the present works. Two mammoth 450 horsepower hydraulic presses are to be installed. Two additional spur tracks also are to be run to the works. Some 300 hands in all will be employed when the new structure is completed.

Richard Burton, of Boston, has filed in the United States district court an involuntary petition in bankruptcy against the Champion Copper Company, a Maine corporation.

In his annual address Henry I. Harriman, president of the Boston Chamber of Commerce, says the copper industry would be benefited by a return of peace conditions. At the present time there is practically no stock of copper on hand, but it is a mistaken idea that the scarcity is due entirely to government demands for the manufacture of war munitions. The consumption of copper has gradually increased for the past half century with the advance of civilization, and the metal is finding its way with a steadily increasing demand in the field of electricity, telegraphy, telephone, trolleys, etc., and being substituted for other commodities. The electric engine is gradually taking the place of the steam engine; copper wire is being used in place of iron, steel and aluminum wire, and many modern inventions are finding use for copper on a very extensive scale. In spite of the urgent demands of the government for copper it is physically impossible to bring the production up to a point to meet the demand.

"High prices for silver are of considerable importance to the big silver producers, such as the American Smelting, Anaconda and U. S. Smelting, and adds to the profits of such companies as East Butte, which are primarily copper properties, but produce silver on a limited scale. The year 1918 promises better prices for lead and spelter, which suffered last year by a disastrous overexpansion in new zinc smelters; heavy influx of cheap Australian zinc ores and an overproduction. The output of lead and zinc has been curbed, the demand has improved, and prospects are now brighter for the lead and spelter companies."—R. T. E.

ROCHESTER, N. Y.

MARCH 11, 1918.

The industrial situation in this city has shown improvement during the past month, particularly, of course, since the advent of more favorable weather conditions. With the arrival of spring and a gradual clearing of the railroad situation, manufacturing institutions are looking forward to better days and increased output of finished materials.

The coal shortage, heatless days, and lightless nights had a serious effect upon local industries, some of which have made no effort to catch up with positions lost during that unfortunate period. The outlook, however, for the spring manufacturing drive is most auspicious in Rochester. No labor disturbances have appeared to mar surface conditions, and with better shipping and delivering facilities the coming season should be a most prosperous and satisfactory one.

The greatest handicap Rochester metal users have to contend with at this time is the conditions in and about the Pittsburgh district. Shipments of aluminum, as well as other pig metals, out of Pittsburgh have been almost at a standstill of late, owing to the government embargo. The Buffalo, Rochester & Pittsburgh and the Pennsylvania Railroads have been held up in carrying needed materials to this locality for some time. Manufacturers are anxious to know just what position the government authorities will take in the railroad matter, how they propose to handle government shipments to the exclusion of the output of other industries.

Within a few weeks several new and extensive plants will begin active work on government contracts. Two cannon plants, besides machine gun, aeroplane and submarine boat parts, are about ready to start active operations. The Rochester Boat Works at the port of Rochester (Charlotte) have completed the construction of three mine-laying tugs for the Navy department, and have contracted to build eight more such ships. Much copper is used in sheathing these vessels.

The copper market in this city is strong, but deliveries are slow. Sheet copper is quoted at 31@32c. base. Yellow brass eased off recently, and sheets can now be obtained at 27@27½c., and rods at 24¾c. Aluminum is firmly held and is up a cent. The metal is quoted here to-day at 37@39c., Pittsburgh delivery. The spelter market is quiet, and quotable at 7.70c. There is a brisk demand for lead, in fact better than has existed in many months. Lead is quoted here at 7.55@7.60c.—G. B. E.

MONTREAL, CANADA

MARCH 11, 1918.

The brass copper aluminum and metal industries in Montreal obeyed the edict of the National Fuel Commissioner of Canada and closed their entire plants Saturday and Monday, February 9 and 11. The order called for the closing of all manufacturing plants in the Dominion these two days and was obeyed to the letter of the law. There were a number of plants that could have been exempted under the ruling, but accepted the ruling as it gave them an opportunity to make some necessary repairs after running at a high tension for the past three years.

This city being the largest and most important manufacturing centre in the whole Dominion felt the effect of the order to a greater extent than any other city in Canada.

The Dominion Bridge Company, located at Lachine, a suburb of Montreal, which controls the Dominion Copper Products Company, also the Montreal Ammunition Company which are subsidiaries and whose plants are located adjoining that of the Bridge concern, are very busy on the production of war material and Mr. Harrington, the superintendent, reported that they are all ready to start on a United States contract for shrapnel and high explosive cartridge cases. Samples or test pieces have been submitted to the United States Government for approval and all the dies have been made up ready to go ahead.

This concern has filled large contracts for the British Government for cartridge cases for 18 pounder shrapnel shells, and will have no difficulties or delay in this United States order as the machines are all ready to operate.

The National Acme Screw Machine Company, Ltd., a branch of the parent concern at Cleveland, O., are doing a good business in a general line of screw machine products at their plant located on De Courcelle street and Grand Trunk Railroad.

The Jenkins Brothers Company, Ltd., located on St. Remi street and Grand Trunk Railroad, are very busy on their well known brand of steam valves which have a world-wide reputation. They are also doing considerable business in the manufacture of naval and marine brass goods which are going to be an important item in Canadian shipbuilding.—P. W. B.

CINCINNATI, OHIO

MARCH 11, 1918.

Activity in the various branches of the metal trades continues at a high rate in this vicinity, the needs of the Federal Govern-

ment in its requirements of war munitions of all sorts furnishing much of the reason for this, as the case has been for a long time in the past. The consequence is that the machine-tool plants, producing the equipment needed in the manufacture of munitions, and the foundries and castings plants, are working to capacity, limited only by the difficulty of securing men to fill a three-shift force. The lack of skilled labor, in fact, is one of the chief difficulties experienced by the machine-tool people, and all of them are seeking help. Several plants are trying the experiment of taking green hands and training them for the work, in considerable numbers, and this has worked fairly well, although, of course, such a labor supply is not in any degree as desirable as that of men already experienced in the work. The relief from the "heatless holidays," which hampered some plants not engaged directly, in work which exempted them, was received with general rejoicing, as even those plants which were permitted to work without interruption found that there was to a certain degree difficulty in working under the conditions then experienced. However, this is now past, and the improvement in transportation conditions has also been such as to help out the general situation decidedly. It is now hoped that such a congestion of traffic will not be permitted to occur again, the centralized operation of the railroads under Federal direction being calculated, it is believed, to help toward this end.

A number of machine-tool and allied manufacturers were present at the hearing held by the Ohio Industrial Commission at the Hotel Sinton, Cincinnati, on February 27, to discuss the regulations on factory lighting announced by the commission. The object of the lighting code is to assure such illumination in factories of all sorts as to reduce accidents to a minimum, and at the same time to aid in bringing production to the highest possible point. Specific figures as to the amount of light required in factories of various sorts are laid down. Davies Lunkenheimer, of the Lunkenheimer Company, was one of a committee of three manufacturers appointed by the commission to take the matter up with Cincinnati concerns affected.

W. J. Emmes, vice-president and secretary of the Boye & Emmes Machine Tool Company, has the distinction of having all of his four stalwart sons in the service of the country. Chauncey Emmes is now in France, with Pershing's army; George Emmes is in the Navy, and Benjamin and Wesley Emmes, the latter only eighteen years of age, are in the Aviation Corps. Mr. Emmes stated his personal platform not long ago as follows: "To help our boys to emerge from the frightful contest as victors, and to aid my country in making the world safe for democracy by defeating autocracy, is my platform, and in aid of it I shall pledge all of my possessions and my personal activities." Giving four sons is a fine example of the fact that Mr. Emmes means what he says.

The Troy Metal Products Company has been incorporated in Cincinnati with a capital stock of $300,000, by A. G. Stouder, W. H. Bowyer, J. E. Edgar, C. C. Willard and J. M. Spencer.

At Warren, O., M. A. and L. J. Garvey, experienced brass manufacturers, are planning to start a brass foundry, with the aid of the board of trade. A plant has been secured which is now being equipped, and operations will start as soon as possible. M. A. Garvey will superintendent operations.

The plant of the American Zinc Products Company, organized at Warren, O., to operate at Greencastle, Ind., where a sheet-zinc rolling mill is being equipped, will be ready for operation early in the spring, it is announced. A number of products formerly made from copper and tinplate will be made of zinc in this plant.—K. C. C.

COLUMBUS, OHIO

MARCH 11, 1918.

The metal market in central Ohio territory has been rather active during the past month. Demand from all metal-using concerns continues good and some few are placing orders more liberally. But on the whole, buying is being done from hand to mouth, as it were, and very few users are anxious to accumulate large surplus stocks.

The worst feature of the trade at this time is the slowness in receiving stocks. Freight congestion is still bad and embargoes are still prevalent. But there is a slight improvement in shipping facilities since the zero weather has passed.

Prices are firm at the levels which have prevailed for several months. This applies especially to brass, copper and tin. Aluminum is selling well and demand for that metal is extremely strong. Brass and copper are both strong. Zinc and spelter are also in fair demand. Type metals are selling extremely well, as the printing trade is generally prosperous. Collections are fairly good, although they are not as good as was the case several months ago.

The Trumball Bronze Company, of Warren, Ohio, has been incorporated, with a capital of $10,000, to manufacture bronze articles. The incorporators are M. A. Gravey, Thomas N. Boyle, Arthur J. Gilmore, Thomas F. Lyons and S. C. Graber.

The Troy Metal Products Company, of Cincinnati, Ohio, has been incorporated, with a capital of $300,000, to manufacture metal products. The incorporators are A. G. Stouder, W. H. Bowyer, J. E. Edgar, C. C. Willard and J. M. Spencer.

The Ideal Metal Company, of Cincinnati, Ohio, has been incorporated, with a capital of $25,000, to deal in metal. The incorporators are L. H. Wessling, William Lovell, George T. Easke, John H. Menke and Edward Vonder Haar.

The Gem City Smelting and Brass Castings Company, of Montgomery county, has been incorporated, with a capital of $25,000, to do a smelting and brass casting business. The incorporators are Solomon Slavin, Solomon Mannheimer, Arthur A. McDonald, Sarah Slavin and Bertha McDonald.—J. W. L.

CLEVELAND, OHIO

MARCH 11, 1918.

Contract for the new building of the Monarch Brass Company, which is to be erected at Payne avenue and East 45th street, has been awarded to the S. W. Emerson Company. This plant will cost upwards of $12,000.

The Rubay Company, manufacturing aeroplane parts and automobile bodies, is planning the erection of a one-story mill on the West Side.

The Buckeye Brass and Manufacturing Company is considering the erection of a machine shop and foundry, each to be in separate buildings.

With a view toward organizing the industries of Cleveland, to assist the Government in the successful conduct of the war from the manufacturing point of view, several prominent factors in the metal industry have been enrolled in the Cleveland War Industries Commission, of which every producer in Cleveland is expected to be a member. J. H. Foster, president of the Hydraulic Pressed Steel Company, has been appointed chairman. Others on the committee are E. E. Allyne, president of the Aluminum Castings Company; F. M. Wyss, of the Aluminum Castings Company, and others prominently identified with the metal industry of Cleveland. Textiles, clothing, machinery and machine products and other branches of manufacturing industry are represented. More than 200 firms here have furnished the committee with data concerning their production.

After nine years as a newspaper merchant, Joseph J. Bauer, well-known youth of downtown Cleveland, is about to realize his ambition. He has saved up enough money now to be able to open a sheet metal shop on Superior avenue in the East End.

Through transfer of the Aviation Corps of the United States Army from Washington to Cleveland this month, Cleveland becomes the center around which manufacture of all aeroplane parts will revolve. About 26 offices of the corps are now quartered in the Union building. From these offices all contracts for the construction of aeroplanes and motor trucks for the aviation section will be let. These offices also will oversee the manufacture and assembly of all parts for planes. From these offices likewise will be directed the production of aeroplanes being made in Detroit, Buffalo, Columbus, Dayton and Akron, as well as Cleveland. Reduction of all costs and delays will be obtained, as Cleveland is held to be the center of the aluminum castings industry. Importance of the removal to Cleveland is indicated by the fact that these offices have charge of $60,000,000 appropriation for war plane expenditures.

H. D. Baker, brother of Secretary of War Baker, has resigned from the Eagle Aircraft Company, of this city. Mr. Baker's retirement is believed to be a reflection of proposed investigation of the Eagle firm by the Senate. The Eagle has a plant at Niles, Ohio.

The Wagner Manufacturing Company, manufacturing alumi-

num ware, has increased its capital stock from $250,000 to $500,000.

Preparations for tremendous output of tractors by Cleveland firms are being made. Word has just been received here that the Chandler Motor Car Company has taken a $10,000,000 contract for the Government to produce heavy duty tractors, and according to President F. C. Chandler, this will require several years to complete. Additions to the Cleveland plant will be made to meet this new business. The J. T. Tractor Company and the Cleveland Tractor Company are preparing to produce caterpillar type tractors, and are erecting additions to their plants also.

Large demand for aluminum is expected to develop when the Glenn L. Martin Company, aeroplane producers, start manufacturing air craft in its first unit of factories in the East End, near the lake. C. C. C.

DETROIT, MICH.

MARCH 11, 1918.

The war continues to bring prosperity to the metal trade in this city and vicinity. The latest plant to be added is the new shipbuilding yards in the River Rouge district on the outskirts of the city. Mr. Ford is erecting here a $1,500,000 plant for the construction of small submarine chasers. These boats will be launched in the River Rouge and from there pass into the Detroit River and on into Lake Erie and eventually will make the Atlantic by way of the St. Lawrence River. These new boats will be equipped with high power motors, which are made to a large extent of gray iron. The brass and copper in the construction of the boats also will be considerable. It is the plan of Ford to employ about 15,000 men within a few months.

The Dodge Brothers' gun-recoil plant on the opposite side of the city also is well under way and will employ at least 20,000 men. The Detroit Shell Company, it is understood, soon will be turning out government supplies.

The Ford plant in Highland Park at present is manufacturing aeroplane engines and also parts for the new government standardized submarine chaser, it is reported. This plant is employing about 40,000 persons.

Manufacturers are experiencing their usual difficulty in obtaining railroad cars for transportation purposes. The coal situation is considerably improved, which adds to the manager's comfort of mind. The car shortage, however, is serious, and it is not believed the situation will be greatly improved.

Automobiles are being manufactured on the usual large scale, but perhaps not quite so heavily as a year ago. Many plants are engaged in turning out trucks for the government which are going overland to the coast in large numbers. Hardly a day passes that long lines are not passing out of the city, usually leaving early in the morning.

Practically every brass metal plant in Detroit is heavily stocked with orders.

The local shipbuilding companies have heavy contracts which will consume their time for two years or more. Many ocean-going craft are being constructed here. These boats also require great quantities of brass and copper equipment and the two concerns here maintain large brass plants of their own.

Chandelier manufacturers report a fair line of business but not so brisk as a year ago. Many factories are producing at present electric appliances which are used in connection with motors.—F. J. H.

PHILADELPHIA, PA.

MARCH 11, 1918.

The lead market was reported strong at the close of the month with prices a shade higher. There seems to be an increasing demand. Copper has been in good demand when wanted for government work. The trade reports prices holding at the established price of 23½ cents a pound for car lots and 24 to 67½ cents for smaller quantities. The demand outside of that for government requirements is light. A great improvement in the transportation situation is reported by the trade and both raw material and finished copper is moving more freely.

The Apex Metal and Rubber Company, 716 South Eleventh street, has brought suit in the Municipal Court against the Philadelphia Brass Company, Commercial Trust Building, to recover $580.81, said to be due for merchandise sold.

Arthur T. Doud, formerly superintendent and later works manager of the Hero Manufacturing Company, Adams and Gaul streets, has been appointed general manager of the company. This firm, which engages in the manufacture of metal novelies, has a large contract for the furnishing of gas masks to the United States government.

The metal trades of this city are desirous of securing the raising by the railroads of the embargoes now existing to secure a sufficient supply of metals, particularly sheet metals, to finish government contracts at navy yards, shipbuilding plants, arsenals and other large industrial plants in and near this city.

The metal trades, both employers and employees, breathed a sigh of relief when word came that "Heatless Mondays" were abolished.

Spelter shows little activity and no improvement in the demand upon the part of brass mills and galvanizers was noted. Prices are reported as being steady.

A contract has been awarded by the Girard Smelting and Refining Company for alterations and additions to a storage house at Richmond and Tioga streets, to J. T. Miller, 2315 West Clearfield street, at a cost of $1,000.

A new one story furnace building about 30 x 220 feet of reinforced concrete will be erected by John T. Lucas Company, makers of lead, at their plant, Armingo and Huntingdon streets, at an estimated cost of $20,000.

The American Bronze Company, Lancaster avenue and Railroad street, Berwyn, Pa., is taking bids for a one story addition, 80 x 100 feet.

Men in the metal industry are much concerned over the announcement that ninety-six freight stations lying beyond the boundaries of the city but embraced in a radius of approximately ten miles from City Hall are included in an embargo placed by the Philadelphia District Committee on Car Service against the shipment of carload or less than carload freight from point to point within the city which went into effect February 18. The purpose is said to be to conserve railroad terminal facilities. The committee represents the Pennsylvania, Baltimore and Ohio, and Philadelphia and Reading Railroads.

The annual meeting of the Enterprise Manufacturing Company of Pennsylvania, and an election for a board of directors to serve for the ensuing year will be held at the office of the company, Third and Dauphin streets, at two o'clock Wednesday, March 13, according to Eugene E. Kiehl, secretary.

An interesting article, "The Jobber of Sheet Metal, Is He a Necessary Spoke in the Wheel of Business?" has been sent out by the Educational Committee of the Metal Club of Philadelphia. It is pointed out that the jobber or so-called middleman is generally looked on by the public-at-large as a highwayman and is responsible for the high prices and other distasteful conditions. He has no control over prices, the article says, and his place in business is one of greatest importance and it is urged that the service rendered by him be appreciated.

Electroplaters report business as quiet with chemicals used by them as hard to obtain even at the high prevailing prices. The falling off in business is due to some extent to the decline in building, due to war conditions and the winter weather, as little work is being done upon materials that enter into building construction. Rossberg and Snyder, 217 North Tenth street, and the Washington Plating Company, 125 North Fourth street, report that they are feeling the effects of the quiet spell.

Continued activity is reported by the Abrasive Material Company, manufacturers of grinding wheels, Fraley and Tacony streets, although having considerable trouble in making shipments. This firm has orders for more than a million dollars' worth of stock, sufficient to keep them running to capacity the balance of the year. The firm has a fair supply of raw material on hand and has been enabled to obtain sufficient coal to continue operation at full capacity.

Business with the Miller Lock Company, Frankford, is good and many large orders are held by this firm. Orders call for shipment to various points in United States, Mexico and South America.

A great scarcity of galvanized sheets is existing in Philadelphia today, according to metal men. The manufacturers and

others in the metal industry here are seriously handicapped because of the inability to secure emergency orders of sheets. It is not the desire of the Philadelphia men to secure a large supply of the stock for general distribution, but would like to have a sufficient quantity to supply war needs. The trade wants to cooperate with the government in every way and not hold up shipments of supplies required by the military forces and the Red Cross, but they feel that it is only right that the work for the government which requires this stock should not be interfered with by the holding up of shipments.—F. W. C.

TRENTON, N. J.

MARCH 11, 1918.

With the lifting of the national fuel order in allowing manufacturing plants to operate six days a week and the increase in the arrival of coal supplies the metal industry establishments in this city are beginning to get down to normal conditions again. This greatly interfered with not only turning out the necessary orders, but also caused a shrinkage in the pay of thousands of employes. All the employes of metal industry establishments are not receiving extra big wages and the reduction in the working time to five days a week had a telling effect upon living conditions. Now the plants are running on full time again. After the government order was rescinded the Public Service Electric Company, which supplies electrical current to several hundred manufacturing plants, announced that it was short of coal and that it would have to cease furnishing power to the many plants for several days. Now that the plants are running full time again one of the stumbling blocks is the shipment of freight due to the embargo. When it was found that freight could not be shipped on time in the usual way manufacturers had to have it sent via express. This plan of shipment is, of course, more expensive and cuts into the profits on goods.

The National Metal Stamping, 494 Mulberry street, Newark, will make a number of alterations to its storage plant. The American Smelting & Refining Company, Perth Amboy, N. J., has let a contract for a new boiler house of large dimensions. The Art Metal Works, 7 Mulberry street, Newark, has awarded a contract for a two and four-story plant addition, 120 x 132 feet in size, to cost $25,000. The American Metal Company, with offices at 15 Exchange Place, Jersey City, has filed a certificate of dissolution with the Secretary of State.—C. A. L.

SAN FRANCISCO, CAL.

JANUARY 7, 1918.

The December, 1917, issue of Chippings, the bright little journal of the California Foundrymen's Association of San Francisco, contains some very interesting matter which I think will prove entertaining to the readers of THE METAL INDUSTRY:

As the Foremen's and Superintendents' Club has taken up the matter of education, or brushing up the minds of the foundry trade of this section in the art of Class A Foundry Practice, it has occurred to me that it would be a first class idea to adopt certain text books to govern the progress of this course. There are several very good books on foundry practice and, no doubt, the committee will adopt one or more of these. However, they do not cover a long-felt want in the foundry game. We should have something to fill in the gap while waiting for this higher education.

Suppose we should forget some of the points. We should have a handy reference to take the place of the real thing. Many years ago I heard of a text book, a real life saver, and have been trying to locate a copy of same ever since. It was supposed to be entitled, "Molders' Book of a Thousand Excuses." We have all heard extracts taken from this book nearly every day, but I doubt very much if there is any man living today who has seen an original copy. I believe the original is carved in stone and lies buried somewhere in Egypt. Assuming that it is a fact that a good excuse is almost the equivalent of a good casting, or castings, I have decided to tackle the job, with your kind assistance, of compiling these many valuable bits of knowledge, thus making them available to all of our good friends in the foundry game. It should be edited in handy pocket-book size and dedicated to the foundry trade for the purpose of making life less miserable for all around.

"BOOK OF A THOUSAND EXCUSES FOR ALL PERSONS CONNECTED WITH THE FOUNDRY TRADE."

1st Chapter—Molder's Excuse for Bad Casting.
2nd Chapter—Molder Boss' Excuse for Non-delivery of Castings.
3rd Chapter—Coremaker's Excuse for Defective Cores.
4th Chapter—Melter's Excuse for Poor Melting.
5th Chapter—Pattern Makers' Excuse for Defective Patterns.
6th Chapter—Foundry Foreman's Excuse for Getting Home Late from Shop.
7th Chapter—Owner's Excuse for Staying in the Foundry Business.
8th Chapter—Machinist's Excuse for Defective Machine Job.
9th Chapter—Molder Apprentice's Excuse for Leaving the Foundry Trade.
10th Chapter—Machine Shop Boss' Excuse for Non-delivery of Job.
11th Chapter—Pattern Maker's Excuse for Non-delivery of Patterns on Time.
12th Chapter—Machine Shop Owner's Excuse for Constructing a Machine Shop.

The above twelve chapters will not cover all of the metal trades and will be added to as required. One chapter will be published in each issue of *Chippings*, and you are requested to hand in to the secretary any good live excuse which you no doubt have stored away in the pigeon hole of your shop desk, for the good of the cause. Perhaps some sister foundrymen's society would be interested in collaborating with us. We should be pleased to receive suggestions.

Another gem from Chippings is as follows:

JERUSALEM AND SCRAP

BY MR. DROOLY.

I see by th' paapers, Mr. Drooly, that th' English have captured Jerusalem, an' I'm wonderin' what they'll do wid it now that they've got it, Mr. Drooly.

Well, Mr. Cassidy, ye see it's this way. Th' Americans captured New York wance an' th' didn't keep it; but I don't mind tellin' ye, Cassidy, that ivery wan has a curiosity to see what kind av a burg it is, because wid Jerusalem full av 'em an' New York full av 'em the two towns must be nearly alike and preety soon ye'll read that th' Jerusalem Bank and Trust Company hav' built a tensthory buildin' an th' corner av Solomon and El Omar Sthreets, an' will be ready fer th' crowd after Yom Kippur an' th' next thing ye'll see, Cassidy, is that th' Gethsemane Improvement Company is sellin' town lots wid all improvements almost in—but it won't work in Jerusalem, Mr. Cassidy, it won't work.

Why won't it work, Mr. Drooly?

Well, ye see, Cassidy, ther' won't be anny Gentiles there at all at all, an' if ther's no Gentiles to collect th' coin fer thim how can th' take it away, Cassidy?

Well, Mr. Drooly, they're a graate people fer all that, an' what wud we do wid all th' old sthoves an' busted pipes an' pieces av iron and bottles an' rags if th' Junkies didn't come along wance in a while an' take it away from us?

I'll tell ye, Cassidy, I was talkin' wid a foundryman th' other day and he sez, sezze, Th' throuble wid th' scraps av iron we're gettin' from them now is—it aint Kosher no more—it's full av burnt grate bars an' bolts an' talkin' machines an' door knobs, sezze, an' it aint so heavy as it used to be unless ye weigh it an yer own scales, sezze, and nowadays when th' says th' stuff they're sendin' is "heavy" ye get awl ready to get th' dhrop in workin' order an' whin th' car comes in—th' heaviest piece is an old broken hinge from a bird cage, sezze. An' it's not at all funny to find a Ford engine or two in th' pile, sezze, an' th' Lord knows ther's no iron in thim. It's scandalous, sezze. An' when ther'e stuck an th' price, sezze, they thry to git up a combine to divide th' loss among th' customers, sezze. I sez to him, pwhat're ye goin' to do about it? an' he sez, Th' news from th' Palestine front is important, sezze—cause if they go over there to colonize it, sezze, we can get some decent scrap, sezze.

Sure, Mr. Drooly—that's all right—but who'll sell th' scrap when they're all gone?

Well, Cassidy—I can't say who'll do it thin, but if I was givin' anny advice to thim Sand Pounders that buy it, Cassidy—I'd say they'd better keep it out av th' hands av th' Scotch. Good night, Mr. Cassidy.

C. J. P. X. Y. Z.

VERIFIED NEWS OF THE METAL INDUSTRY FROM SCATTERED SOURCES

The Aluminum Products Company of Oakland, Cal., is building an addition to its plant on East 11th street. The company operates a tool room, spinning, stamping and polishing departments.

The Canadian Metal & Equipment Company, Ld., 195 Alexander street, Vancouver, B. C., is building a small plant for the refining and alloying of white and yellow metals, melting down drosses, etc. The company are not in the market for equipment, except for a small reverberatory furnace for drosses.

The Humphrey Bronze and Aluminum Company, Bellefontaine, Ohio, is now operating its new plant for the manufacture of brass, bronze and aluminum castings and is soliciting business for such work. The company operates a brass, bronze and aluminum foundry, casting shop, nickel plating and polishing departments.

The North Western Stamping Company, Burlington, Ia., is considering the construction of a one-story plant, 100 x 300 feet, but it has not been definitely decided as yet whether the building will be constructed this spring. The company operates a machine shop, tool room, stamping, tinning, galvanizing, soldering, polishing, japanning and lacquering departments.

The Rome Brass & Copper Company, Rome, N. Y., has taken a plant survey to learn the number of men unnaturalized, those desiring citizenship, those wishing to learn English, etc. A Settlement House has been constructed as the recreational and social centre of the employees and their families.

The Mueller Metals Company, Port Huron, Mich., brass founders, has awarded the contract for a group of factories and a power plant to be erected at an estimated cost of $500,000. The company operates a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, casting shop, rolling mill, stamping, plating departments.

ELECTION OF OFFICERS

The following officers were elected by the board of directors of the **Baltimore Tube Company,** makers of seamless brass and copper tubing, Baltimore, Md., for the ensuing year: C. S. Morse, president; Charles E. F. Clarke, vice-president; Walter M. Bush, treasurer, and Robert S. Stringer, secretary.

REMOVAL

St. Louis Machine Company, St. Louis, Mo., has moved its offices from 2607-2609 South Broadway to 922-932 Loughborough avenue.

The office of the **Union Smelting & Refining Company,** Inc., has been moved from 14th street and avenue D, New York, to St. Charles street and avenue L, Newark, N. J., where their new 11 acre plant is located.

INCREASE IN CAPITAL STOCK

The Eagle Brass Foundry Company, Seattle, Wash., which recently completed a new plant, has recently increased its capital stock from $10,000 to $50,000.

The Hancock Manufacturing Company, Charlotte, Mich., manufacturers of brass goods, has increased its capital from $100,000 to $200,000. The company operates a brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, and stamping, soldering, plating, polishing and lacquering departments.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To Manufacture Wire-Drawing Machinery and Dies.—The Connecticut Wire Die Company, Inc., Derby, Conn. Capital, $25,000. Incorporators: Frank H. Speh, president, and Albert H. Yudkin, treasurer.

To Manufacture Metals.—The William Duncan Company, Boston, Mass. Capital, $75,000. Incorporators: Justin A. Duncan, Andrew W. Duncan, Walter L. Duncan, Frederick Duncan, William W. Duncan, Clementine L. Duncan, Ellen E. Duncan and Jennie L. Goodson. The company will operate a brass, bronze and aluminum foundry.

The Aluminum Ware Manufacturing Company, Inc., of Elmira, N. Y., with a capitalization of $1,000,000, has been formed by John E. Potter, president of the National Aluminum Works, Elmira, N. Y., and James H. Opp, for many years connected with the Aluminum Goods Manufacturing Company. This reorganization brings under one management the National Aluminum Works at Elmira, N. Y., the Aluminum Plated Ware Company, Newark, N. J., and the Toy Phone and Woodware Manufacturers, Inc., New York. The facilities of the plants are to be increased immediately and more products will be added to the company's well-known lines of aluminum wares.

McKENNA BRASS AND MANUFACTURING COMPANY

The McKenna Brass and Manufacturing Company, Pittsburgh, Pa., has the distinction of carrying more than 500,000 pounds of sheet brass, copper rod, tubing and pipe in sizes to accommodate the trade—a business that is no small one considering the Pittsburgh district, covering one of the largest manufacturing centers of the United States.

The company states that it is able to supply anything required in this line of business and can make quick delivery of products. The company operates a foundry for the production of castings in brass, bronze and aluminum, which they state is unexcelled in its facilities for serving the trade. A modern system for electro-plating and finishing has been installed, which produces the finest and most durable finishes in nickel plate, brush brass, oxidized copper and statuary bronze.

BRISTOL BRASS COMPANY, BRISTOL, CONN.

The annual report of the **Bristol Brass Company** has been issued, coupled with notice of the annual meeting on Tuesday, February 26, at 2 p. m.

The annual financial statement shows net operating profit for the year of $444,977.71. The cash balance December 31, 1916, of $785,619.71, less dividend payments chargeable in 1917 (including dividend payment of January 10, 1918) of $100,000, leaves the surplus balance December 31, 1917, $1,130,597.42.

The assets of the company are: Cash, $226,166; accounts and notes receivable, $677,894.03; less reserve for fluctuation, $589,832.80; prepaid interest and insurance, $11,893.18; total, $1,485,786.01.

The investments, totalling $88,000 include $80,000 in Liberty bonds. The valuation of plant has advanced from $1,085,986.88, after allowing for depreciation $125,243.01, to $1,724,788.72, after marking off for depreciation $175,036.41.

The reserve for taxes is $266,945.82, and the total liabilities $2,130,597.42, as against total assets of $3,298,597.42. The capital of the company is $1,000,000.

AMERICAN BRASS COMPANY REPORT

The American Brass Company, Waterbury, Conn., comparative statement for 1917 has been issued as follows:

ASSETS.

	1916.	1917.
Real estate, machinery and tools	$13,545,649.37	$13,640,869.27
Expended for permanent improvements including all real estate and Buffalo property	3,551,649.37	8,796,008.27
	$17,096,718.64	$22,436,877.54
Less charged off for depreciation	3,455,849.37	3,500,000.00
	$13,640,869.27	$18,936,877.54
Cash	6,213,914.32	1,750,165.25
Bills receivable	825,423.87	776,882.08
Accounts receivable	8,598,186.64	7,501,593.92
Wood land	184,638.20	202,768.12
Stocks and bonds owned in other companies	1,150,848.85	1,334,311.53
Government bonds	192,172.40	748,720.40
Patents	1,000.00	1,000.00
Merchandise, raw, wrought and in process	10,118,514.51	14,907,227.23
	$40,925,568.06	$46,159,546.07

LIABILITIES.

Capital stock	$15,000,000.00	$15,000,000.00
Current accounts payable	1,905,892.66	1,705,693.65
Reserve for contingencies	4,000,000.00	4,000,000.00
Reserve for taxes		5,000,000.00
Surplus	9,028,005.44	13,344,675.40
	$29,933,898.10	$39,050,369.05
Earnings for the year	10,991,669.96	7,109,177.02
	$40,925,568.06	$46,159,456.07
Surplus, January 1	12,778,005.44	20,019,075.40
Less dividends paid	3,750,000.00	6,675,000.00
	$9,028,005.44	$13,344,675.40
Earnings for the year	10,991,669.96	7,109,177.02
Surplus, December 31	$20,019,675.40	$20,453,852.42

OFFICERS.

Charles F. Brooker, president; Edward L. Frisbie, vice-president; Thomas B. Kent, vice-president; John A. Coe, jr., vice-president; John P. Elton, vice-president and treasurer; Clifford F. Hollister, assistant treasurer; Gordon W. Burnham, secretary; Franklin E. Weaver, assistant secretary; Edmund H. Yates, assistant secretary.

DIRECTORS.

Charles F. Brooker, James E. Elton, Harris Whittemore, Arthur C. James, Gordon W. Burnham, Royal Victor, Edward Holbrook, Edward L. Frisbie, John P. Elton, Cleveland H. Dodge, Thomas B. Kent, T. Brownell Burnham, John E. Wayland, James A. Doughty, John A. Coe, Jr.

WINCHESTER ARMS SHOWS BIG GAINS

The annual report of the Winchester Arms Company presented at the annual meeting February 13 shows a most prosperous condition of the business and indicates a sound financial position. The company will retire $8,000,000 of its outstanding notes and will refund the remaining $8,000,000 by the sale of a like amount of one-year 7 per cent. notes to Kidder, Peabody & Company, Boston. The report shows a net working capital of $12,600,000 after setting aside heavy reserves for plant depreciation. Fixed assets are listed at $21,705,180.13, or, after setting aside a reserve of $7,211,383.35, $14,493,796.78. Current assets are $1,002,289.97. Total current liabilities are $2,242,123.25. Net profit for the year before charging off reserves was $2,160,231.89. Winchester Bennett retires as president, having taken up special work for the company which will require extended absences. He is succeeded as president and treasurer by Thomas G. Bennett, who has been consulting director since retiring from the presidency in 1911. Other officers were re-elected, as follows: John E. Otterson, first vice-president and general manager; Henry Brewer and Frank G. Drew, vice-presidents.

Healthy growth is indicated in the reports submitted by the Michigan Copper & Brass Works, Detroit, Mich., to its stockholders in the annual meeting, February 13. Good gains in assets and surplus were shown. During the directors' and stockholders' meeting in the company's general offices in Detroit, a cash dividend of 3 per cent. was declared, payable on April 1 to stockholders of record of March 15. There is talk of maintaining the stock on a 3 per cent. quarterly basis, but definite action is yet to be taken. Earnings for the year ending December 31, 1917, showed a net figure of $60.20 per share.

26514.—An agency is desired by a man in France for the sale of copper tubes and metallurgical products generally. Payment will be made by cash against documents. Correspondence may be in English. References.

STOCK MARKET QUOTATIONS: METAL COMPANIES

New York, March 11, 1918

	Par	Bid	Asked
Aluminum Company of America	$100	560	610
American Brass	100	235	240
American Hardware Corp.	100	128	132
Bristol Brass	25	45	46
Canadian Car & Foundry, com.	100	21	24
Canadian Car & Foundry, pfd.	100	55	59
Eagle Lock	25	72	75
International Silver, com.	100	40	55
International Silver, pfd.	100	78	83
New Jersey Zinc	100	243	248
Rome Brass & Copper	100	310	335
Scovill Manufacturing	100	460	480
Standard Screw, com.	100	243	248
Standard Screw "A," pfd.	100	103	none offered
Yale & Towne Mfg. Co.	100	205	220

Corrected by J. K. Rice, Jr., & Co., 36 Wall St., New York.

PRINTED MATTER

Metal Library.—The Brown's Copper & Brass Rolling Mills, Limited, New Toronto, Ontario, Canada, by Alex Lentz, manager of sales, announce that they are now located in their new offices and that they have started a library which will be devoted to a collection of literature relating to metals and their production.

Felt Wheels.—The James H. Rhodes & Company, New York, has issued a handsome little booklet describing various varieties of the Foot Brand of felt wheels and cotton buffs used in the finishing of metals. The booklet also contains a list of other polishing room supplies manufactured and sold by this company.

Mineral Foote-Notes.—No. 2 Bulletin of the Foote Mineral Company, Philadelphia, Pa., has been issued as the Mineral Foote-Notes for February. This issue is devoted to Strontium, Its Occurrence, Industrial Application and the Manufacture of its Salts, by Richard K. Meade. There are also contained in the bulletin reviews of current technical literature by Philip E. Browning.

Metal Valves and Fittings.—The McNab & Harlin Manufacturing Company with general offices at 55 John street, New York, has issued a little booklet of special information for superintendents of oil refineries in relation to valves and fittings. This booklet is concerned principally with the new metal recently brought out by this company called Aterite, which is now so largely used for valves on sulphuric acid lines as well as valves in connection with high pressure and temperature vapor lines. A complete list of the chemicals that Aterite is recommended for is given and also a list of those chemicals whose use would be detrimental to Aterite. There are also tables of physical properties of the metal. Copies of this pamphlet may be had upon request.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.
MARCH 11, 1918.

COPPER.

Early 1918 estimates of 200,000,000 pounds monthly production of copper during the first half of this year were modified in view of the transportation difficulties, to 185,000,000 pounds as the average for January and February. Exports in January were approximately 109,000,000 pounds, according to custom house returns. Trade estimates for February were approximately 78,000,000 pounds, but these figures may be considerably altered when Government returns are complete. Upon this basis, about 182,000,000 pounds were available for domestic requirements, but with Government needs during the first two months estimated at 120,000,000 pounds, only about 62,000,000 pounds were available for consumers not engaged in the manufacture of war munitions.

The most interesting development to the trade was the demand for an increase in charges, late in the month, for refining copper made by these interests who set forth claims that because of increased wages to labor, the higher cost of chemicals and other necessary material, that they could not operate at a sufficient profit under existing charges. While producers recognize the facts underlying the demand, it is maintained that they were considered in the conferences that extended the 23.50c. per pound price to June next. Some consumers during the month, complained of difficulty in obtaining supplies owing to the reserve of producers. New transactions during February were very quiet at the prices established by the Government, 23½c. per pound for wholesale lots and 24.67½c. for less than carloads.

TIN.

Spot tin of any kind was most difficult to obtain during February, a small quantity of American 99 per cent. tin being available from time to time at 85-86c. per pound for spot and at 82-84c. per pound for nearby delivery late in the month.

SPELTER.

Suspense as to Government action in fixing of prices in the spelter market was not relieved until February 15, when official announcement was made that the maximum base for grade A spelter is 12c. per pound, sheet zinc 15c. per pound and plate zinc 14c. per pound, the latter ½ inch or more in thickness; the conditions governing are the same as those applying to the sale of copper. These prices are to remain in force until June 1, when they may be revised or continued.

LEAD.

Traffic congestion and railroad embargoes seriously interfered with business transactions in the lead industry during February. Stocks at refineries and in the markets were scarce but there was plenty of lead in transit in cars that should have arrived at destination weeks ago. In view of the scarcity of spot metal sellers were naturally reserved and prices advanced ½c. per pound during the month to 7.50c. New York basis, 7.25c. East St. Louis basis at the close in the outside market. Large export sales were reported late in the month.

ALUMINUM.

Aluminum continued inactive at January closing prices until late in the month when a firmer tone developed and prices advanced on all varieties 1c. per pound on the 25th to 37-39c. for No. 1 virgin 98-99 per cent.; to 35-37c. for pure 98-99 per cent. remelted and to 28-30c. for No. 12 alloy remelted. The value of primary aluminum made in the United States during 1917 was $45,882,000, or $11,982,000 greater than the value of aluminum made in 1916. The increase while partly due to changes in prices, was chiefly attributed to the increased production of metal. A despatch to the New York *Times*, March 4, states:

Announcement was made today by the War Industries Board that President Wilson, after investigation by the Federal Trade Board as to the cost of production, has approved an agreement made with the producers of aluminum, fixing a maximum base price of 32 cents a pound at the various American plants, and their subsidiaries, subject to revision on June 1, 1918; such price to cover lots of fifty tons and over of ingots of a grade 98 to 99 per cent.

The differentials now in force for the different grades, quantities, and shapes will continue in force for new contracts.

The conditions of the agreement are:

First—That the producers will not reduce the wages now being paid.

Second—That they will sell to the Allies, to the public, and to the Government at the same price.

Third—That they will take the necessary measures, under the direction of the War Industries Board, for the distribution of the aluminum to prevent it from falling into the hands of speculators, who might increase the price to the public.

Fourth—That they pledge themselves to exert every effort necessary to keep up the production of aluminum so as to insure an adequate supply as long as the war lasts.

ANTIMONY.

Antimony was quiet in February, but some government buying was accomplished. According to one report, direct purchases of metal were made from Western ore and metal producers, but this was not confirmed. The Navy Department inquiry for 130,000 pounds, the bids for which were opened late in the month, were awarded at 13.50c. for the Brooklyn delivery and at 13.87½c. per pound for the Portsmouth delivery. The Brooklyn contract calls for 30,000 pounds and the Portsmouth order for 100,000 pounds. Prices under lack of demand receded from 14.00-14.25c. at the beginning of the month to 13.25-13.50c., the lowest point for the month by the February 21 after which there was an advance on the inside limit, 13.25c. to 13.37½c.; the outside limit remaining unchanged at 13.50c. per pound.

SILVER.

Silver in February opened at the January closing 86⅝c. per ounce, and after being stationary for more than a week, a gradual decline set in that carried to 85⅛c. by the close, a total recession of 1½c. for the month.

QUICKSILVER.

Quicksilver declined from $125 per flask of 75 pounds to $115 per flask on the 19th, after which there was no change.

PLATINUM.

All supplies of platinum in the United States were commandeered by the Government late in February. Prices throughout the month remained unchanged at the January closing $105 for pure and $113 for 10 per cent. iridium.

OLD METALS.

Old metals during February were quiet as a whole. No. 1 pewter was active early in the month and advanced 6-7c. to 48-50c. per pound. Heavy brass advanced ¼c. on good buying. Tin, pewter, solder scrap and high grade babbitt also sold well at unchanged prices. Toward the close a better feeling was in evidence and aluminum scraps, particularly cast aluminum, became active. White brass and composition turnings were also in good demand.

WATERBURY AVERAGE

Lake Copper. Average for 1917—30.97. 1918—January, 23.50. February, 23.50.

Brass Mill Spelter. Average for 1917—11.116. 1918—January, 9.60. February, 9.60.

FEBRUARY MOVEMENTS IN METALS

	Highest	Lowest	Average
COPPER:			
Lake	*23.50	*23.50	*23.50
Electrolytic	*23.50	*23.50	*23.50
Casting	*23.50	*23.50	*23.50
TIN	market nom.; no metal offering		
LEAD	7.50	6.87½	7.139
SPELTER	8.12½	7.85	7.962
ANTIMONY	14.25	13.25	13.668
ALUMINUM	39.00	36.00	37.25
QUICKSILVER (per flask)	$125.00	$115.00	$120.625
SILVER (cts. per oz)	.86⅝	.85⅛	85.716

Metal Prices, March 11, 1918

NEW METALS.

	Price per lb.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Electrolytic, carload lots, nom.. } Lake, carload lots, nominal.... } Government price	23½
Casting, carload lots, nominal	23½
TIN—Duty Free.	
Straits of Malacca, carload lots	none offered
LEAD—Duty Pig, Bars and Old 25%; pipe and sheets.	
20%. Pig lead, carload lots	7.50
SPELTER—Duty 15%	
Brass Special	8.25
Prime Western, carload lots, nominal	7.80
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½ per lb.	
Small lots, f. o. b. factory.... } 100-lb. f. o. b. factory..... } Government price Ton lots, f. o. b. factory..... }	32c.
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot.	.13½
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad valorem.	
Shot or Ingots	50c.
ELECTROLYTIC—5 cents per pound extra.	
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	$2.25
BISMUTH—Duty free	$3.50
CADMIUM—Duty free	nominal $1.80
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	$3.50
QUICKSILVER—Duty, 10% per flask of 75 pounds	$125.00
PLATINUM—Duty free, per ounce	$105.00
SILVER—Government assay—Duty free, per ounce	.85⅛
GOLD—Duty free, per ounce	$20.67

INGOT METALS.

		Price per lb.
Silicon Copper, 10%	according to quantity	49 to55
Silicon Copper, 20%	" "	50 to55
Phosphor Copper, guaranteed 15%	" "	53 to60
Phosphor Copper, guaranteed 10%	" "	47 to57
Manganese Copper, 30%, 2% Iron	" "	56 to62
Phosphor Tin, guaranteed 5%..	" "	96 to1.01
Phosphor Tin, no guarantee	" "	95 to1.00
Brass Ingot, Yellow	" "	17 to19
Brass Ingot, Red	" "	25 to26
Bronze Ingot	" "	24 to25½
Parsons Manganese Bronze Ingots	" "	30½to32
Manganese Bronze Castings	" "	58 to61
Manganese Bronze Ingots	" "	26 to30
Phosphor Bronze	" "	24 to30
Casting Aluminum Alloys	" "	38 to39

OLD METALS.

Dealers' Buying Prices.		Dealers' Selling Prices.
22.00	Heavy Cut Copper	23.50
22.00	Copper Wire	23.50
19.00	Light Copper	21.00
21.00	Heavy Mach. Comp.	23.50
14.00	Heavy Brass	16.00
10.50	Light Brass	12.50
13.00	No. 1 Yellow Brass Turning	15.00
18.00	No. 1 Comp. Turnings	21.00
6.50	Heavy Lead	6.75
6.00 to 6.25	Zinc Scrap	6.25 to 6.75
10.00 to 13.00	Scrap Aluminum Turnings	11.00 to 14.00
18.00 to 20.00	Scrap Aluminum, cast alloyed	20.00 to 22.00
26.00 to 28.00	Scrap Aluminum, sheet (new)	28.00 to 30.00
50.00	No. 1 Pewter	50.00
22.00 to 23.00	Old Nickel anodes	25.00 to 26.00
30.00 to 32.00	Old Nickel	34.00 to 36.00

PRICES OF SHEET COPPER.

Mill shipments (hot rolled)	31½c. base net
From stock	33c. base net

The following table shows the advance in cents per pound over the base price of sheet copper of various gauges, lengths and widths.

Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. to 32 oz.	16 oz. to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
		CENTS PER LB.				CENTS PER LB. OVER BASE.				
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not Wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							
	Longer than 120 ins.	5	8							
Wider than 120 ins., but not wider than 132 ins.	Not longer than 132 ins.	6	9							
	Longer than 132 ins.	7								
Wider than 132 ins.		8								

[The insert shows the extras on copper sheets from 10, 9, 8 and less than 8 oz. in weight, and various lengths and widths.]

Width.	LENGTH.	Light than 8 oz.	8 oz.	9 oz.	10 oz.
Not wider than 30 ins.	Not longer than 72 inches.	9			
	Longer than 72 inches. Not longer than 96 inches.	6	9		
	Not longer than 72 inches.	4½	7½		
Wider than 30 ins., but not wider than 36 ins.	Longer than 72 inches. Not longer than 96 inches.	3	6		
Wider than 36 ins., but not wider than 48 ins.	Not longer than 72 inches.				

The longest dimension in any sheet shall be considered as its length.

Metal Prices, March 11, 1918

Extras for Copper Sheets.

Circles, 8 in. diameter and larger, segments and pattern sheets, advance per pound over prices of sheet copper required to cut them from..... 3c.

Circles less than 8 in. in diameter, advance per pound over prices of sheet copper required to cut them from..... 2c.

Cold or hard rolled copper, 14 oz. per square foot and heavier, advance per pound over foregoing prices..... 1c.

Cold or hard rolled copper, lighter than 14 oz. per square foot, advance per pound over foregoing prices..... 2c.

Cold rolled annealed copper, the same price as cold rolled copper.

All polished copper, 20 in. wide and under, advance per square foot over the price of cold rolled copper..... 1c.

All polished copper, over 20 in. wide, advance per square foot over the price of cold rolled copper..... 2c.

For polishing both sides, double the above price.

The polishing extra for circles and segments to be charged on the full size of the sheet from which they are cut.

Cold rolled copper, prepared suitable for polishing, same prices and extras as polished copper.

All planished copper, advance per square foot over the prices for polished copper..... 1c.

Tinning.

Tinning sheets on one side, all sizes, per square foot, 5c.

For tinning both sides double the above price.

Extra for tinning or polishing circles and segments, to be charged on the full size of the sheet from which they are cut.

For tinning edges of sheets, one or both sides, prices shall be the same as for tinning all of one side of the specified sheet.

Oval Copper Bottoms.

Tinned One Side.

16 oz. to square foot and heavier, per pound.....Base
15 oz. to square foot per lb., advance over base..... ½c.
14 " " " " " " " " " .....1c.
13 " " " " " " " " " .....1½c.
12 " " " " " " " " " .....2c.
11 " " " " " " " " " .....3c.
10 " " " " " " " " " .....4c.
Lighter than 10 oz. to square foot, per pound.....7c.

Round copper bottoms, tinned one side, 8 in. (203.2) diameter to 17 in. (431.8) diameter, both inclusive, 1c. per lb. advance over ovals.

Copper circles, tinned one side, less than 8 in. (203.2) diameter, 3c. per lb. additional.

Copper circles, tinned one side, over 17 in. (431.8) diameter, not classed as copper bottoms.

Polished oval and round tinned copper bottoms, same advance as for sheets.

Copper Anodes or Battery Plates Not Larger Than 20 x 30.

⅜ in. (9.5) and thicker, untrimmed..... lb.
⅛ in. (9.5) and thicker, trimmed to size..... lb.
If drilled, full weight before drilling to be charged.

Nickel-Plated Copper.

Net Cash Prices.

Sheets 14 x 48 (355.6 x 1219.2) Inches.

	Advance over base per lb.	Plating per sheet
14 and 16 oz. and heavier, by the case of 500 pounds and over.....	6c.	40c.
14 and 16 oz. and heavier, less than one case....	7c.	42c.
12 oz. and lighter, by the case.....	8c.	40c.
12 oz. and lighter, less than one case.....	9c.	42c.

Boiler Sizes.

Over 12 (.40) Oz.

By the case of 500 lbs., 7 in. (177.8) (14 x 52) (355.6 x 1320.8).....	6c.	45c.
By the case of 500 lbs., 8 in. (203.2) (14 x 56) (355.6 x 1422.4).....	6c.	45c.
By the case of 500 lbs., 9 in. (227.6) (14 x 60) (355.6 x 1523.6).....	6c.	50c.

For less quantity than one case, add 2c. per lb. 12 oz. and lighter, add 3c. per lb.

Tinning.

For copper nickel plated on one side and tinned on the other, add for
All sizes, per square foot.....3½c.

Note.—The figures in heavy face type in all cases represent metric measurements.

BARE COPPER WIRE—CARLOAD LOTS.

26½c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order..... 37c. per lb. base
100 lbs. to 300 lbs. in one order..... 38c. " " "
Less than 100 lbs in one order..... 39½c. " " "

PRICES FOR SEAMLESS COPPER TUBING.

38 to 41 base.

PRICES ON BRASS MATERIAL—MILL SHIPMENTS

In effect January 3, 1918.

To customers who buy 5,000 lbs. or more per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.28	$0.31	$0.33
Wire	.28	.32	.34
Rod	.26	.32	.34
Brazed tubing	.36	—	.41
Open seam tubing	.36	—	.41
Angles and channels	.36	—	.41

To customers who buy less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.29½	$0.32½	$0.34½
Wire	.29½	.33½	.35½
Rod	.27½	.33½	.35½
Brazed tubing	.37½	—	.42½
Open seam tubing	.39½	—	.42½
Angles and channels	.37½	—	.42½

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

PRICES FOR SEAMLESS BRASS TUBING.

35½ to 38½ base.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

35½ to 38½ base.

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

Due to fluctuations of the metal market we are unable to quote these prices.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod..... 33½c. net base
Muntz or Yellow Metal Sheathing (14" x 48") ..30c. " "
Muntz or Yellow Metal Rectangular sheets other than Sheathing .....33c. " "
Muntz or Yellow Metal Rod..... 31c. " "
Above are for 100 lbs. or more in one order.

Metal Prices, March 11, 1918

PRICES OF SHEET ZINC

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 15c. basis, less 8%

Casks, jobbers' prices..... 19½c.

Open casks, jobbers' prices..... 20c.

The above prices have been fixed by the United States Government, applying to civilian population of the United States and allied governments, but not for export.

PRICES OF ALUMINUM

Sheet Aluminum, outside market contract base price, 55c. per pound.

Sheet Aluminum, outside market stock, and mill prompt shipment, 60c. per pound.

98-99% Remelt Aluminum Ingots, outside market, no quotation.

No. 1 Virgin Aluminum Ingots, outside market, 32c. per pound. Aluminum Rods and Wire, outside market, prompt shipment, 32c. per pound.

EXTRAS FOR FLAT SHEETS ROLLING.

	To 18 Ga.	18-20	21-24	25-26	27	28	29	30	32	34
3 to 26" wide—										
24 to 96" long	Base	Base	.01	.02	.03	.04	.05	.06	.07	.08
97 to 120" "	Base	Base	.02	.03	.04	.05	.07	.08	..	..
121 to 156" "	Base	.01	.03	.05	.08	.10	..	..	..	..
26 to 47" wide—										
24 to 96" long	Base	Base	.03	.04	.05	.06	.08	.10	..	..
97 to 120" "	Base	Base	.04	.06	.07	.08	..	..	..	..
121 to 156" "	Base	.01	.05	..	..	..	..	..	..	..
48 to 60" wide—										
24 to 96" long	Base	Base	.06	.10	..	..	..	..	..	..
96 to 120" "	Base	Base	.08	..	..	..	..	..	..	..
121 to 156" "	.01	.01	.10	..	..	..	..	..	..	..
60 to 68" wide—										
24 to 96" long	Base	Base	.05	..	..	..	..	..	..	..
96 to 120" "	.01	.01	.08	..	..	..	..	..	..	..
121 to 156" "	.02	.02	..	..	..	..	..	..	..	..

EXTRAS FOR STRIP ROLLED SHEETS.

	3-13	14	15	16	18	20	21	22	24
12 to 15 Ga., Inc.	Base	Base	Base	Base	Base	.01	.02	.02	.03
16-17	Base	Base	Base	Base	Base	.01	.02	.02	.04
18-20	Base	Base	Base	Base	.01	.02	.03	.04	.05
21-22	Base	Base	Base	.01	.02	.02	.04	.05	.06
23-24	Base	Base	.01	.02	.02	.03	.05	.06	.08
25	Base	Base	.01	.02	.03	.04	..	..	..
26	.01	.01	.02	.03	.04	.05	..	..	..
27	.01	.01	.02	.03	.05	.06	..	..	..
28	.02	.02	.03	.05	.07	..	..	..	..
29	.02	.02	.03	.05	.08	..	..	..	..
30	.03	.03	.04	.06	..	..	..	..	..
32	.04	.04	.06	..	..	..	..	..	..
34	.05	.06	..	..	..	..	..	..	..

EXTRAS FOR SHEARING.

	12 to 20	21 to 26	27 to 30	31 to 34
Less than 3" to 1½" wide	.01	.02	.03	.04
Less than 1½" to ¾" wide	.02	.03	.04	.06
3 to 30" wide—				
12 to 24" long	.02	.03	.04	.07
6 to 12" long	.04	.05	.06	.08
3 to 6" long	.06	.08	.09	.10

Circles 3c. per pound extra.

BASE PRICE GRADE "B" NICKEL (GERMAN) SILVER SHEET METAL

Quality.	Net per lb.	Quality.	Net per lb.
5%	42½c.	16%	47c.
8%	43½c.	18%	47½c.
10%	43¾c.	20%	49¼c.
12%	45½c.	25%	57c.
15%	49c.	30%	62½c.

NICKEL (GERMAN) SILVER WIRE

Quality.	Net per lb.	Quality.	Net per lb.
5%	44c.	15%	52c.
8%	46c.	16%	52½c.
10%	48c.	18%	54½c.
12%	50c.	30%	70c.

The above Base Prices are subject to additions for extras as per list printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are correspondingly higher.

PRICES FOR SHEET BLOCK TIN AND BRITTANNIA METAL

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 5c. over Pig Tin. 50 to 100 lbs., 7c. over 25 to 50 lbs., 8c. over, less than 25 lbs., 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more, 2c. over Pig Tin. 50 to 100 lbs., 4c over, 25 to 50 lbs., 5c. over, less than 25 lbs., 8c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

LEAD FOIL

Base price—5.75 cents per lb.

TIN FOIL

Base price—65 cents per lb.

PLATERS METALS

Platers' bar in the rough, 65c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES OF SHEET SILVER

Rolled silver anodes .999 fine are quoted at —— above the price of bullion. Manufacturers state that as silver is selling at a premium at the present time they are unable to give any quotation.

PRICES OF NICKEL ANODES

85 to 87%	purity	52½c. per lb.
90 to 92%	"	55c. " "
95 to 97%	"	57½c. " "

Supply Prices, March 11, 1918

PRICES OF SOME METAL INDUSTRY CHEMICALS AND MATERIALS

Acid—		
Acetic, 30%	lb.	—
Acetic, glacial, 99½%, carboys	lb.	—
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Com., 18 deg	lb.	.08
Hydrochloric, C. P., 22 deg	lb.	*.16
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg	lb.	.09¼
Nitric, 42 deg	lb.	.11⅛
Sulphuric, 66 deg	lb.	.08
Alcohol, wood, 95%	gal.	—
Denatured	gal.	1.05
Alum—		
Lump	lb.	.09
Powdered	lb.	.15
Aluminum sulphate, iron free	lb.	.15
Aluminum chloride solution	lb.	.16
Ammonia aqua, 26 deg., carboys	lb.	—
Ammonium carbonate	lb.	—
Chloride	lb.	—
Hydrosulphuret	lb.	—
Sulphate, tech.	lb.	.10
Sulphocyanide	lb.	—
Amyl acetate	gal.	—
Arsenic, white	lb.	—
Argols, white, see Cream of Tartar	lb.	.75
Asphaltum	lb.	.35
Benzol, pure	gal.	1.00
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate)	lb.	.15
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide	lb.	.20
Chrome Green	lb.	—
Cobalt Chloride	lb.	—
Copper—		
Acetate (Verdigris)	lb.	—
Carbonate	lb.	.40
Cyanide	lb.	1.00
Sulphate	lb.	.17
Copperas (Iron Sulphate)	lb.	.06
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.75
Crocus	lb.	.10
Dextrin	lb.	.20
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	—
Gold Chloride	oz.	12.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron Sulphate, see Copperas	lb.	.06
Lead Acetate (Sugar of Lead)	lb.	.35
Yellow Oxide (Litharge)	lb.	.20
Liver of Sulphur, see Potassium Sulphide	lb.	.15
Mercury Bichloride (Corrosive Sublimate)	lb.	—
Nickel—		
Carbonate, dry	lb.	.80
Chloride	lb.	.70
Salts, single bbl.	lb.	.14
Salts, double bbl.	lb.	.12
Niter (Saltpeter), see Potassium Nitrate.		
Paraffin	lb.	.20
Phosphorus—Duty free, according to quality		nominal
Potash, Caustic (Potassium Hydrate)	lb.	—
Lump	lb.	—
Potassium Bichromate	lb.	—
Carbonate, 34-36%	lb.	—
Cyanide, 98-99½%	lb.	—
Sulphocyanide	lb.	—
Pumice, ground	lb.	—
Quartz, powdered	ton	—
Official	oz.	.73⅓
Rosin	lb.	.08
Rouge, nickel	lb.	.25
Silver and gold	lb.	.40
Sal Ammoniac (Ammonium Chloride)	lb.	—
Sal Soda	lb.	.05
Silver Chloride, dry	oz.	—
Cyanide	oz.	—
Nitrate	oz.	.58
Soda Ash, 58%	lb.	.08
Sodium—		
Biborate, see Borax	lb.	.15
Bisulphite	lb.	.15
Cyanide	lb.	.37
Hydrate (Caustic Soda)	lb.	.15
Hyposulphite	lb.	.08
Nitrate, tech.	lb.	.10
Phosphate	lb.	.14
Silicate (Water Glass)	lb.	.05
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.35
Sulphur (Brimstone)	lb.	.10
Tin, Chloride	lb.	.75
Tripoli Composition	lb.	.06
Verdigris, see Copper Acetate	lb.	—
Water Glass, see Sodium Silicate	lb.	.05
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	*.60
Whiting	lb.	.05
Zinc, Carbonate	lb.	.30
Chloride	lb.	.35
Cyanide	lb.	*1.00
Sulphate	lb.	.12

PRICES FOR COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base	$56.15
14 " 20 " 64/68 "	"	75.00
12 " 20 " 84/92 "	"	61.70
14 " 20 " 84/92 "	"	80.00

Sewed buffs per pound.

Bleached and unbleached	base	49c.
Colored	"	46c.

PRICES FOR FELT WHEELS

White Spanish— Diameter	Thickness	Price
6 to 9 inch	1 to 3 inch	$2.60 per lb.
10 to 16 "	1 to 3 "	2.50 " "
6 to 16 "	From ½ inch to less than 1 inch	2.80 " "
Over 16 "	Over 3 inch	2.60 " "
6 to 16 "	Under ½ inch	2.90 " "

Mexican Wheels— Diameter	Thickness	Price
6 to 9 inch	1 to 3 inch	$2.50 per lb.
10 to 16 "	1 to 3 "	2.40 " "
6 to 16 "	From ½ inch to less than 1 inch	2.70 " "
Over 16 "	Over 3 inch	2.50 " "
6 to 16 "	Under ½ inch	2.80 " "

*Wholesale price.